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Public WLAN

The interaction between venues and WISPs

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Preface

This Masters Thesis will conclude my education at the Lund School of Economics and Management, and it is fair to say that it has been the most rewarding part of my academic journey.

Researching an emerging and largely unexplored area such as the public Wireless LAN industry has been greatly facilitated by the support of BrainHeart Capital. Both the financial sponsorship, which enabled my research in the US, and the sharing of their profound knowledge of the industry have contributed immensely towards the quality of the thesis. The BrainHeart staff, especially Lee Wermelin and Magnus Melander has been very helpful and supportive.

I also would like to thank my tutor at Lund School of Economics and Management, professor Allan T. Malm, for his advice.

The empiric studies involved interviews with close to 50 professionals in the industry, who have taken time off their busy schedules to offer me their knowledge and thoughts, most often with great enthusiasm and interest. Their participation has of course been vital to the end results.

Last but not least I want to extend my gratefulness towards Paul Saffo, who made it possible for me to use the Institute For The Future in Menlo Park as a base during my stay in Menlo Park, as well to the rest of the staff of IFTF who where most helpful and welcoming.

I encourage the reader to contact me with any questions or comments regarding the thesis

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Executive summary

Keywords: Wireless, WLAN, Business models, Venue, WISP, Wi-Fi, 802.11

Title: Public WLAN – The interaction between venues and WISPs

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Purpose: The purpose is to research different co-operations between venue owners and WISPs, when WLAN is deployed in a public space. The aim is to establish viable business models for the interaction between the two vital actors in the public WLAN industry.

In this work, the advantages and disadvantages of revenue and cost sharing will be defined, along with technical and commercial issues that need to be resolved.

Methodology: A number of case studies of the current situation have been conducted in the most attractive venues for WLAN, airports. As the public WLAN market had most widespread adoption and is most mature in the USA, case airports were chosen both there and in Scandinavia. To best research the situation in both areas, one month where spent for interviews in the US.

Conclusion: The main conclusion is that venue owners, to improve overall efficiency and long-term profitability, should take a larger part of the financing of public WLAN deployment. As compensation for the increased business risk, ways of sharing of the revenue stream generated should be evaluated.

Even if the venues might feel comfortable in the short term with avoiding investment and business risks, such an option is inherently unstable as longer-term revenues might be foregone. Forcing WISPs out of business might be detrimental also for the venue and its customers. More two-sided business models are bound to prove more efficient and revenue generating.

1 Introduction of the public WLAN industry

An introduction to the public WLAN industry is followed by a presentation of the problems that will be addressed in this thesis. In addition delimitation, target group and definitions of the different terms used in the thesis are presented.

While the telco's around the world invests billions into 3G, small broadband "hotspots" are emerging based on technology that already has widespread adoption. This technology is referred to as Wireless LAN (WLAN) or sometimes Wi-Fi.[1] With WLAN, data transfer speeds of 11 Mbps is possible using short-range radio technology and the unregulated 2.4 Ghz frequency. According to Gartner, over half of all major US companies will have deployed WLAN in some of their offices by 2002, and over 7 million WLAN cards have been sold since 1999.[2] Several computer manufacturers such as Toshiba and Apple now sell their products with WLAN support embedded.

A new business world emerges in the WLAN industry, different from the 3G development, which is led by the established carriers. New and independent companies have dominated as providers of public WLAN services so far. These providers are referred to as Wireless Internet Service Providers (WISPs). One can foresee several categories of WISPs, the most likely are:

- Mobile operators who incorporates WLAN into their existing services.
- ISPs and broadband providers who extend their businesses.
- Greenfield players, i.e. new companies based on the WISP idea alone.
- Venues such as airports and hotels who run the service themselves become a possibility because of the unregulated and relatively affordable WLAN technology.

In 2001, there were 250 hotspots in Europe and 1770 in USA according to BWCS[3]. By 2006 BWCS predicts there will be 115 000 public hotspots world wide, 69 000 of those in the USA.

Venues such as airports, hotels and cafes are prime locations for deployment of public WLAN. But convention centers, sports arenas, malls and even amusement parks are also mentioned as prime locations for the service. At the end of year 2000, hotspot locations where divided according to Figure 1.

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[1] See 1.4 for definitions of terms used in the thesis
[2] Gartner Dataquest," Half of all businesses to deploy Wireless LANs by 2002", 2001-01-08
[3] BWCS, " The wireless threat to 3G", 2001

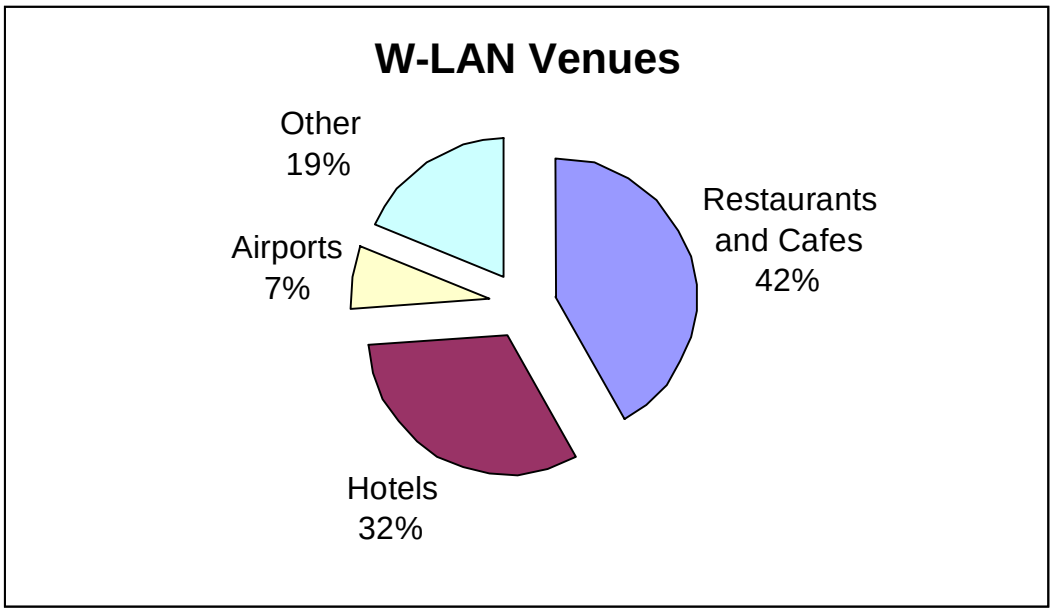

Fig 1"Others" include convention centers, shopping malls etc. Source: BWCS.

1.1 Introduction to the thesis

As the research firm Analysis points out in a report concerning WLAN[4], the dynamics of hotspot roll-out will be very different from that of cellular networks, where rights to use a portion of the spectrum within a certain country or region are bought.

Huge amounts where spent in auctions for 3G licenses conducted by European governments during 2000, over 30 billion dollars in the UK alone. This will not happen with the unregulated WLAN technology. Instead it is the property owners, and not the regulator or the government, which stand to benefit from base station installations. A major problem at the moment however is that costs for rollout of WLAN are much higher than revenue. The WISP MobileStar estimates the cost for the 25 largest airports in the US to be equipped with WLAN to 1.1 billion USD[5] for infrastructure alone, if the additional fees that some venues charge are added the figure rises even more.

But with revenues from public WLAN estimated to have been a mere 1.1 million USD

[4] Analysis, " Public Wireless LAN Access: A threat to mobile operators?" 2001
[5] Presentation by Mobilestar for WAA, "Business models and relationships", 2001-01-19

during 2000[6], people involved in the industry believe that widespread demand for public WLAN is still a few years off. As most venue/WISP co-operations run for a 3-5 year period only, the financial stress on the WISPs, which so far have been left with paying most of the cost for rollout, is high.

During 2001, several WISPs have gone out of business, or have found themselves in severe financial troubles. According to Stephen Saltzman, General Manager of WLAN at Intel, this is due to what he refers to as "brain dead" agreements between WISPs and venue owners, where the venues have virtually not participated in the financing of the infrastructure at all, and in many cases also received large exclusive rights fees. [7] As a result many venues ended up with no service at all, when their WISP went out of business or refused to follow through with the contract.

The key question addressed in this Masters thesis is the interaction between the venue owners and the WISPs.

Similarities can be seen with the 3G auctions in Europe during 2000, where as previously mentioned, some governments used their role as regulators to extract huge amounts from carriers, desperate to loose out on a license to the perceived future profit generator. Many of the highest bidders are now in financial difficulties, and the end result has been delays in the rollout of 3G.

It is not unlikely that the 3G developments will be reflected with WLAN services, if not viable business models emerge. Providing public WLAN services is clearly not within the venues core competence, yet they have found themselves as owners to a very attractive arena for what many feels is a potentially large and profitable business. Will they run the services themselves or co-operate with specialized WISP operators? How should these co-operations look like for greatest efficiency?

1.2 Purpose

The purpose is to research different co-operations between venue owners and WISPs, when WLAN is deployed in a public space. The aim is to establish viable business models for the interaction between the two vital actors in the public WLAN industry.

In this work, the advantages and disadvantages of revenue and cost sharing will be defined, along with technical and commercial issues that need to be resolved.

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[6] Allied Business Intelligence, " Wireless LAN public hotspots: Assessment of Business models, Service rollouts and revenue forecasts", 2001

[7] Interview with Stephen Saltzman, 2002-01-03

1.3 Delimitations

Choice of venue type

The possible venues for public WLAN are virtually endless. Currently the main targets are cafés, hotels, conference centers and airports, but in the future sports arenas and shopping malls for example are being mentioned as prime locations for WLAN.

To research the situation in all these venues would be impossible in the time-space allowed for this thesis, and hence he research scope on the venue-side will be limited to cover airports. This specific venue type has been chosen because wireless analysts regard it as one of the key venues to use for setting up a profitable WLAN service. While airports account for only 7% of the number of hotspots deployed, the venue has high likelihood of reaching early profitability. This is due to among other things the high amount of target audience present in a limited space, with plenty of idle time that could be used more effectively. [8] In addition to airports, the deployment of WLAN in business lounges and airplanes will be covered with one case each, as they are closely related.

Geographic delimitation

While public WLAN hotspots are emerging all over the world, a geographic delimitation was called for in order to reach a conclusion within the given time frame. A decision was made to research the most mature regions, Scandinavia and the USA.

1.4 Definitions[9][10]

In alphabetical order

AP: Short for **A**ccess **P**oint, a hardware device that acts as a communication hub for users of a wireless device to connect to WLAN.

Cellular carrier: A predominantly US for an operator of cellular (also referred to as PCS in the US) services. In Europe the term Mobile Operator is used instead. In the thesis carrier, operator and telco will be used interchangeably. Examples of cellular carriers are Cingular, Sprint PCS and Telia Mobile.

Enabler: An enabler is a company that provide authentication, billing and other necessary services for providing public WLAN.

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[8] BWCS, ” The wireless threat to 3G”, 2001
[9] www.webopedia.com, 2002-02-04
[10] www.excilan.com, 2002-02-05

Roaming: The possibility for an end-user of a WLAN device to use the services of an operator other than the one(s) he has bought the services of. Roaming implicitly indicates a relationship between a visited WISP, a home WISP and the end-user who is client of the latter.

- **Bilateral roaming agreement:** a roaming agreement signed between two WISPs directly.
- **Multilateral roaming agreement:** a roaming agreement signed between a WISP and a central legal entity representing a community of member-WISP. Such an agreement allows for flexible tariffs with certain roaming partners while the entire administration is centralized.
- **Roaming Agent:** A legal entity operating as representative of the WISP community with the aim of facilitating the roaming administration (both from a legal and commercial point of view) of a WISP. The agent does not become a party in the roaming agreement between the WISPs (like Roaming Brokers do) and retains a neutral position with regard to tariffs and service content offered by the WISP. An agent operates a multilateral roaming model and typically offers multilateral settlement services.
- **Roaming brokers:** An entity providing a (global) WISP network by trading broadband access between member WISPs at a fixed or transactional price. Brokers typically provide centralized authentication services in order to compute and validate the broadband traffic. Brokers fix the WISP airtime prices they trade in.

  A broker is also an entity operating as intermediary between the WISPs by buying and re-selling the WISPs airtime minutes by fixing the tariffs for roaming. It may also typically include the clearing and settlement services between the broker and the operator on a bilateral basis.

Venue: A public place such as a hotel, café or airport, where public WLAN could be deployed.

WECA Short for **W**ireless **E**thernet **C**ompatibility **A**lliance, an organization made up of leading wireless equipment and software providers with

	the mission of guaranteeing interoperability of Wi-Fi products and to promote Wi-Fi as the global WLAN standard across all markets.
WEP	Short for **W**ired **E**quivalent **P**rivacy, a security protocol 802.11b. WEP is designed to provide the same level of security as that of a wired LAN. WEP aims to provide security by encrypting data over radio waves so that it is protected as it is transmitted from one end point to another. However, it has been found that WEP is not as secure as once believed, due to how it was implemented.
Wi-Fi	Wi-Fi is short for **Wi**reless **Fi**delity and is another name for IEEE 802.11 and WLAN. It is a trade term promulgated by WECA. Products certified as Wi-Fi by WECA are interoperable with each other even if they are from different manufacturers. A user with a Wi-Fi product can use any brand of access point with any other brand of client hardware that is built to the Wi-Fi standard.[11]
WISP:	Short for **W**ireless **ISP**, a service provider of public WLAN. • **Home WISP:** the provider whom the end-user has a client relationship with. • **Visited WISP:** the provider that allows access to its network to clients of the home WISP. • **Virtual WISP:** A WISP that has not deployed and does not operate a WLAN infrastructure but offers the same services to its client base.
3G	An ITU (International Telecommunication Union) specification for the third generation (analog cellular was the first generation, digital the second) of mobile communications technology. 3G promises increased bandwidth, up to 384 Kbps when a device is stationary or moving at pedestrian speed, 128 Kbps in a car, and 2 Mbps in fixed applications.
802.11	Refers to a family of specifications developed by the IEEE for W-LAN technology. 802.11 specify an over-the-air interface between a wireless client and a base station or between two wireless clients. The IEEE accepted the specification in 1997.

[11] www.webopedia.com, 2002-02-04

There are several specifications in the 802.11 family:

- **802.11** Provides 1 or 2 Mbps transmission in the 2.4 GHz band, ratified in 1997.
- **802.11b** Also referred to Wi-Fi, and is the standard used by all WISPs and venues covered in this thesis. An extension to 802.11 that applies to wireless LANS and provides 11 Mbps transmission. 802.11b is the 1999 ratification to the original 802.11 standard, allowing wireless functionality comparable to Ethernet.
- **802.11a** An extension to 802.11 that applies to wireless LANs and provides up to 54 Mbps in the 5GHz band. While hardware is for sale in the market, it is as of yet currently not widely adopted. 802.11a is seen as the next step in the WLAN market.
- **802.11g** An improvement of the 802.11b standard providing 20+ Mbps in the 2.4 GHz band. Hardware not yet on the market in larger number.

1.5 Target audience

First and foremost, this thesis is intended for the faculty and students of the Business Department of Lund School of Economics. In addition, it will be of interest for anyone involved in business-side developments in the data/telecom business.

The reader is presumed to have basic knowledge of the wireless industry in general. For those in need of further insights, chapter four contains information about the current developments in the wireless industry in general and the WLAN area in particular.

1.6 Disposition

Chapter 1 ***Introduction:*** The background and relevance of the research area is presented, followed by the purpose of the thesis. Delimitations and definitions are also included.

Chapter 2 ***Methodology:*** This chapter contains 1) Background to the choice of research strategy, 2) Description of research design and data collection methods, 3) Discussion of the quality of the research

Chapter 3 ***Theoretical framework:*** In this chapter the theories on which the analysis will be based on are explained. The aim of the theoretical framework is to provide a solid base of established theories to aid in the explanation of how a viable business model for interaction between venues and WISPs could be formed.

Chapter 4 ***Public WLAN markets:*** The current development of public WLAN is outlined, with issues such as end user demand scenarios, roaming and technological development highlighted.

Chapter 5: ***Case studies*****:** In this chapter the findings of the case studies performed in both Scandinavia and the USA is presented. The presentation of the cases follow a common framework with both the situation today and future strategy included.

Chapter 6 ***Analysis and summary:*** In this final chapter the findings of the case studies is presented, and related with the theoretical framework. Also included are suggestions for future research

2 Methodology

This chapter contains 1) Background to the choice of research strategy, 2) Description of research design and data collection methods, 3) Discussion of the quality of the research

2.1 Research strategy

To provide a framework for the thesis, a general overview of the industry was initially performed of the WLAN market by using secondary material such as research reports and articles. In addition people with extensive knowledge of the wireless industry where interviewed. These interviews and discussions provided necessary input to formulate the research question into a relevant and as of yet unanswered one.

As it was established early on that the market for public WLAN is most mature in the USA, one month were spent there for interviews. An advantage to studying both Scandinavia and the US is the significant differences in consumer preferences. The Nordic region is very cell phone centric, while the US consumer relies on PDAs and laptops for communications. These differences might potentially influence the types of business models used by WISPs and venues.

2.2 Choice of research method

After reviewing research literature it was concluded that using the explanatory case study as a research method would be most useful in researching a highly volatile environment like the WLAN industry.

The case study is one of several ways of conducting explorative social science research. Others include experiments, surveys and analysis of historical research. According to Yin (1994) choice of research strategy depends on:

a) The type of research question.

b) The control an investigator has over actual behavioral events, and

c) The focus on contemporary as opposed to historical phenomena.

When, as is the case in this thesis, a "how" or "why" question is posed, a researcher has little control over events and the focus is on a contemporary phenomenon, case studies is the preferred method. The aim with this thesis is to answer the question of how co-operation could be arranged most effectively in the public WLAN industry. To answer that question there is a need to research how the currently used business models looks like.

2.3 Research design

The choice to research a multitude of mini-cases (versus extensive work on a single case) is explained by the fact that the WLAN business is still emerging. It is relevant for fulfilling my purpose that all aspects are covered, as several different business models have developed in different venues. The reason for choosing to do cases on airports, relates to the fact that these venues are amongst the early adopters in this emerging market. Many major airports already have up and running WLAN services.

In the case studies the current situation is mapped, including future plans are. In addition it is of interest to research how business models turned out in earlier deployment of similar non-core competence services, such as cellular services and tax-free shops for example.

Choice of cases

After the initial interviews made with industry analysts, the airports with the most interesting solutions where chosen. During the progress of the research, some airports where added, if they where considered to have any special quality that might aid the conclusions of the thesis. Predominantly larger airports where chosen, as these are of most interest to WISPs.

There was no need for a screening process in Scandinavia, as the small population of the region only validates a few larger international airports. Hence the goal in this area is to do case studies on all major Scandinavian airports. In addition the development of WLAN in business lounges and airplanes is presented, with SAS as case company.

Choice of WISPs

All WISPs active in any of the case airports are presented, with their strategy towards co-operation with venues reviewed. In addition, WISPs with interesting business models regarding their relationship with venues, discovered during the empiric studies are also presented.

2.4 Data collection

2.4.1 Primary data

The primary data has mainly been collected through a large number of in-depth interviews. These have been conducted with all case airports, all larger WISPs and other relevant companies in the WLAN industry such as Palm, Intel, Cisco and Sprint.

As part of the research I attended two conferences concerning the thesis subject, the BrainHeart WISP seminar in Stockholm and the 802.11 conference in Santa Clara. Presentations and panel discussions, as well as informal discussions with attendees provided

valuable material incorporated in the thesis.

2.4.2 Selection of interview objects

Concerning the venues, if possible the Information system managers where interviewed. In some airports they where not available or I was referred to another employee in the information systems department with specific knowledge about the WLAN situation at the airport.

On the WISP side either the presidents or high ranking business development manager where chosen. In some cases the WISPs have employees who exclusively deal with the airport contracts. More information about interviewees can be found in the sources chapter at the end.

2.4.3 Interview method

The interviews where conducted in a qualitative manner, but within a framework to make sure that all issues relevant are addressed. Dane (1990)[12] defines three different categories of interview methods depending on the degree of structure: the structured, partially structured and non-directive interviews.

The partially structured interview will be used in this thesis. Such an interview has a few predetermined questions, but is flexible concerning follow-up questions. It is most effective when the respondents consist of a specific group chosen for their familiarity with the research topic and when the primary emphasis is gaining information about the subjective perceptions of respondents. Whenever possible, the interviews where conducted in person, otherwise by telephone. Frequently follow up questions where made after the interview by e-mail or telephone.

2.4.4 Secondary data

The secondary data used consists of info material provided by interviewed companies, presentations from conferences, newspaper articles, material from newsletters of WLAN focused organizations and reports from analyst firms such as Yankee group, Cahners in-stat, Jupiter, IDC, Gartner, Forrester, Analysis, Nomura and BWCS.

2.5 Research qualities

Construct validity

Construct validity concerns how well an explorative study measures what it is supposed to

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[12] Dane, Francis C., “Research methods”, 1990

measure. Yin (1994)[13] presents three tactics for avoiding researcher subjectivity: Use of multiple sources of evidence, establishment of clear links of a chain of evidence, such as between the data gathered and questions asked and conclusions drawn and the opportunity to have a draft case reviewed by key informants.

As this thesis concerns an emerging and unexplored area, the interviewees will inevitably involve people from within the industry, who have an interest in portraying the WLAN industry in a good light. The empiric material will be based on a large amount of cases, and an even larger amount of interviews. However it must be kept in mind that the self-interest of some interview objects is likely to influence their objectivity in the matter.

Regarding the secondary data, one has to keep in mind that commercial organizations such as Gartner and IDC are highly dependent on sales of market reports, as it is their major source of income. As a consequence, these reports often come up with remarkable conclusions, with attention grabbing headlines. It might be suspected that the intention is to generate higher sales of reports rather than giving an accurate picture of the situation. The forecasts made by these types of organizations have in the past frequently proven to be incorrect, and the use of such forecasts in this thesis is merely to be seen as an illustration of the general market consensus. After all, these reports are widely used in many businesses as tools for outlining future strategy.

Internal validity

Internal validity relates to explanatory studies, rather than explorative studies, so it is not relevant in this paper.

External validity

External validity is the degree to which the results of a study can be generalized, in other words how well the results can be transferred and remain valid to other activities or settings (Yin, 1990). As the scope of the research is narrow, and the technology concerned unlike most other, the external validity might not be so high concerning other industries.

Reliability

The reliability test implies that if the exact same study is repeated, the results should be the same. This means that another researcher would reach the same result as this thesis has with the same access to information.

In this paper a guideline has been used for the interviews, which can be found as an appendix. All references and interviews etc are also attached. Even so, it is likely that circumstances surrounding the interviews, personal subjectivity and external factors such as

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[13] Yin, Robert K., "Case study research-Design and Methods, 2nd edition" 1994

the events of Sept 11 affected the information collected in the cases. Most of the information however is undeniable facts, which can easily be confirmed.

2.6 Use of theory

According to Widersheim & Paul, one can structure research in two different ways, inductive and deductive. The research in this thesis will be structured in a deductive manner, where the theory serves a base for making predictions about new observations.

Established theories relating to the purpose of the thesis will be utilized, and compared with the material gathered in the case studies. The theories will aid the explanation in how a public WLAN service could be organized for high efficiency and reliability by the venue itself, or in collaboration with a WISP or other external actor.

To provide a basic understanding on how value is created for the end user of WLAN services and the venues role in this, the value chain by Porter, and theories on how it can be extended into a value constellation is explained. Motives for and the different forms of co-operations strategies from networks to outsourcing are sorted out, with the level of integration in the relationships defined.

Finally transaction cost economics theory and agency cost theory are elaborated, for use in dealing with how to make the different co-operations and networks work as efficient and profitable as possible. To complement the more recent virtual organization concept by Hagel & Singer (1999) will follow. Virtual organization should according to the authors be the answer to take advantage of the value migration caused by new technology and other drivers.

3 Theoretical framework

In this chapter the theories on which the analysis will be based on are explained. The aim of the theoretical framework is to provide a solid base of established theories to aid in the explanation of how a viable business model for interaction between venues and WISPs could be arranged.

3.1 Value chain models

Value chain

The value chain by Porter (1985)[14] models a business as series of inter-linked activities. Some activities are identified as primary activities and others as secondary or support activities. The primary activities are related directly to the production/ creation of the business product or service. The secondary activities provide support to the primary activities. Examples of primary activities are marketing and logistics. Secondary activities typically involve procurement, R&D and management systems.

Value constellation

Normann & Ramirez (1994)[15] claimed that the value chain is not enough to include all actors involved in the creation of a product or service. That activity involves "an incredibly complex set of activities performed by a very large number of actors." They shift focus from the actual activities performed by a particular firm - the value chain perspective - to the activities that should be performed to provide *offerings* that are of value for customers. The organization of these activities forms a *value constellation*, which may involve a large number of actors and/or organizations contributing to provide a particular offering or set of offerings.

The value constellation perspective shares some characteristics with Michael Porter's value system model but is potentially more flexible as it does not require the identification of a set of activities that will be performed by particular organizations in the first instance - the focus is on the customer and activities that define the offering or set of offerings. The authors further argue that organizations should not just focus on their direct customers but develop levels of analysis that include their customer's customer and even their customer's customer. By broadening the view from a value chain to a value constellation it may be easier to research where and how the value for the end customer is actually created.

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[14] Porter, M.E., " Competitive Strategy: Techniques for Analyzing Industries and Competitors", 1985
[15] Normann, R, Rafael Ramirez, "Designing Interactive Strategy", (1994)

3.2 Strategic alliance and network theory

Motives for alliances

The perspective on co-operative strategy offered by strategic management theory draws the attention to the need for prospective partners to achieve a fit between their respective strategies and core competencies. This is so that an alliance between them makes a positive contribution to the achievement of each party's objectives. Falkner (1995)[16] classifies the motives for alliance formation into a number of internal and external factors, where the internal are:

- Need for specific assets not currently possessed
- The minimization of transaction costs
- The need for speed to market
- The spreading of financial risk

The external factors concerns globalization, uncertainty and need for vast financial resources to cope with fast technological changes.

Networks and alliances

The terms "strategic network" and "strategic alliance" are often used interchangeably[17]. However, there is a clear distinction of the idea of a network with its implication of close but non-exclusive relationships, and that of an alliance, which, however loosely, implies the creation of a joint enterprise at least over a limited time. A virtual corporation generally carries some of the impressions of both (Child & Faulkner 1998)[18].

According to Johansson and Mattson (1991)[19] alliances may be concluded for transaction-cost reasons, but networks never are. Instead networks generally exist for reason stemming from resource-dependency theory, that is one network member provides one function, which is complementary to the other. Although costs also are taken into account as to who is admitted as a network member the loose bonding emphasize autonomy and choice, in contrast to the more deterministic governance structure applied to alliances by transaction

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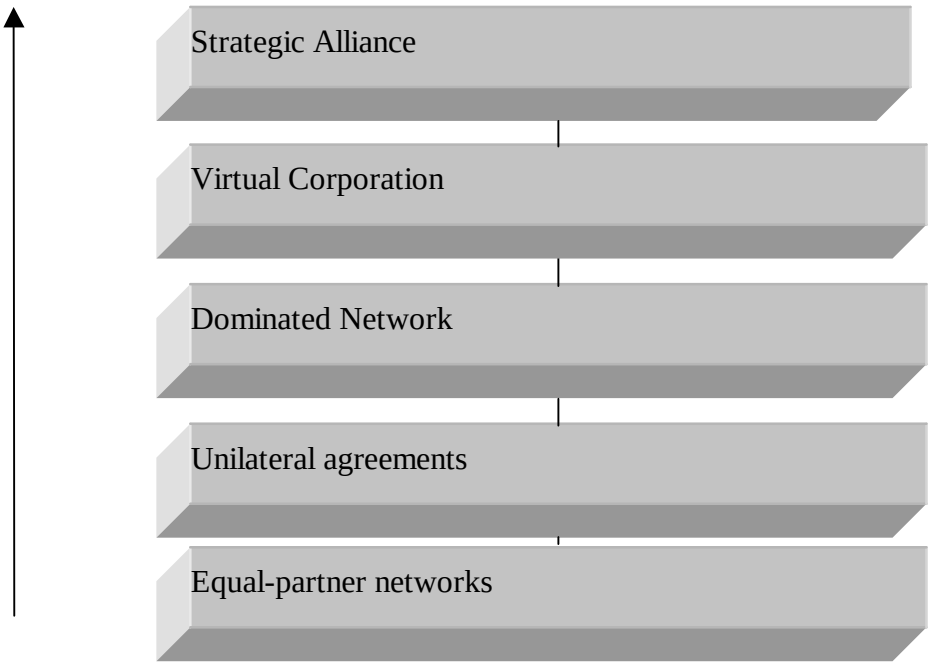
[16] Falkner, D. O, "International Strategic Alliances: Co-operating to compete", 1995
[17] Child.J, & Faulkner, D. "Strategies of co-operation: managing alliances, networks and JV", 1998
[18] Ibid
[19] *Johansson, J. Mattson, L-G*, "Inter organisational Relations in Industrial Systems: A Network approach compared with the transaction cost approach", 1991

cost theorists.

Network relationships

Following the strategic motives for alliance formation is the question of partner selection and how trust can be developed between the partners. Child and Faulkner (1998)[20] classifies networks with regards to how integrated they are. Markets exhibit the lowest degree of interdependence, with each transaction implying no specific probability of a repeat transaction. Hierarchy (Williamson, 1975)[21] is the opposite, with a fully integrated corporation being created.

INTEGRATION HIERARCHY



INDEPENDENCE MARKETS

Fig 3, Level of ascending integration of cooperative forms by Child and Faulkner

The form of cooperation's of interest for this thesis begins with equal partner networks. This type of cooperation exists between companies that work in close relationship with each other, but where wide and exclusive agreements are not made.

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[20] Child.J, & Faulkner, D. "Strategies of co-operation: managing alliances, networks and JV", 1998
[21] Williamson, O.E. "Markets and hierarchies", 1975

Moving up we reach unilateral agreements, where one firm provides another with service on an intimate basis. In situations where one firm has a product and another market access, a unilateral agreement may be set up on an exclusive basis where royalties and minimum sales levels etc are included.

The next form of cooperation is the dominated network, where a dominant player surrounds itself with a wide and varied network of subcontractors. All the institutions involved regard the network as a kind of family, with the hub company as the head.

A closer still form of interdepence is the virtual corporation, which is a loosely coupled enterprise in which the parts are held together through sophisticated IT-solutions. Virtual corporations may be a transitional stage of a company on its way to or from a hierarchy. They might be set up as equal partner or dominated networks.

The highest level short of hierarchy is the strategic alliance. In daily business the term is often used loosely, signifying almost any type of co-operation between companies. In theory it normally takes the form of one of three basic structures - the equity joint venture, the collaboration (little or no equity exchange and no created boundary company), and the consortium. In the strategic alliance, companies merge a limited part of their domain and attempt to achieve a competitive advantage that might individually have eluded them.

3.3 Transaction cost economics (TCE)

Transaction cost economics aim to make business transactions as effective as possible. Transaction costs are those, which are incurred in arranging, managing and monitoring transactions across markets. These include the cost of negotiation, drawing up contracts, managing the necessary logistics, and monitoring accounts receivable. When organizing economic transactions TCE regards the basic choice as being that between effecting these through market exchanges, and internalizing them within a single firm where they are governed by hierarchical relationships embedded in organization structures. Strategic alliances are in transaction cost economics (TCE) viewed as potentially cost-reducing methods of organizing business transactions.

In Williamson (1975)[22] five factors are identified, which are relevant for the choice between internalizing the governance of transactions within firms, as opposed to effecting them through market exchanges. These are opportunism, bounded rationality, small numbers, uncertainty and complexity, and information impactdness.

Opportunism refers to behavior that is self-interested. The notion of bounded rationality recognizes that there are informal and other limitations on the means for dealing with that self-interest. These features are regarded as the two human factors, which pose a problem

[22] Williamson, O.E. “Markets and hierarchies”, (1975)

for the governance of transaction. This is because they respectively identify a major source of risk.

Williamson argues that, when two or more parties transact recurrently under conditions where there are limited numbers of partners to choose between (small numbers), market conditions are uncertain and/or complete, accurate and adequate information relevant to the transactions is known to one or more parties but not to others without their incurring considerable costs (information impactedness) then the more vulnerable partner is likely to benefit from internalizing the transaction or activity within its own more immediate managerial control.

Asset specificity

In Williamson (1985)[23] more attention is given to asset specificity as a point of reference for choosing between the governance structures of transactions. Asset specificity refers to durable investments that cannot easily be used for other activities and which are made in support of particular transactions. The commitment of such assets locks the partners concerned into the given type of transaction. Contractual and/or organizational safeguards are therefore called for to protect the investor in specific-use assets against the risks arising from opportunism, bounded rationality, and uncertainty.

The attributes of a transaction, especially the degree of asset specificity, should play a key role in the choice of an appropriate governance structure. When transactions are not recurring, of relatively short-term duration, and where the assets involved are non-specific, market based transactions are deemed to be suitable. Under such conditions, the market itself backed by the law of contract should provide effective safeguards to the uncertain outcomes. Regarding investments that may take a long time to mature and require unique or transaction-specific investments, they should be conducted more effectively within organizations ("hierarchies").

Williamson also recognizes that two possibilities lie between these two extremes. Both involve assets of mixed specificity, the first case where transactions are occasional and the second case where they are recurrent. In the first case, he suggests that market contracting backed by third-party assistance, such as arbitration and litigation, is an appropriate mode of governance. In the second case, he suggests that relational contraction and bilateral governance should prevail. Relational contracting involves a long-term investment in building relationships between the parties. Bilateral governance, however, can be implemented by the parties making mutual investments of specific assets, which generate mutual dependence and serve as hostages against opportunism.

Relational contracting and bilateral governance admit the possibility of hybrid governance

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[23] Williamson, O.E., “The economic institutions of capitalism”, 1985

structures, intermediate between markets and hierarchies. Hybrids such as joint ventures are characterized by bilateral dependency between the partners, in that they mutually commit equity and assets, and agree on how costs and profits are to be divided between them. I contrast to hierarchies in which one set of owners and/or managers have unilateral authority, the partners to hybrids share rights to control and monitor activities, thus potentially weakening the control each can exercise. To overcome this problem, the partners have to rely on features such as long-term contracts, the offering of mutual hostages such as assets specific to the collaboration, and the development of mutual trust.

Although hybrids offer advantages that TCE identifies: avoidance of the high uncertainty caused by market failure and the high overhead costs of establishing hierarchies, their uneasy position with regard to control lends them an inherent instability. TCE does not explain more irrational ways of building trust in a co-operation, which are governed by more implicit understandings. For this there is Agency theory.

Virtual organization

The migration occurring in value chains have in recent years been subject to widespread research. Hagel (1999)[24] launches the idea that when interaction costs fall, due to new technology, deregulation and other drivers, companies will come under pressure to unbundle their core processes.

This should be done through outsourcing and/or alliances with companies specialized in the respective area. The author claims that in most corporations, three different businesses can be found: a customer relationship business, a product innovation business and an infrastructure business. Although these are integrated in the organization, these businesses are actually very different. They each require different types of people and have a different set of competitive and economic aspects.

When unbundled, the next step in virtual organizing is suggested to be re-bundling, when new organizations are formed through horizontal integration, into more effective units with related capabilities, which can be leveraged into new markets.

3.4 Agency theory

Agency theory is concerned with the governance mechanisms, which limit the agent's self-serving behavior. According to Eisenhart (1989)[25] agency theory like TCE assumes that human behavior is self-interested, subject to bounded rationality and risk adversity. Furthermore, it says that there is asymmetrical information exists between principals and agents.

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[24] Hagel III, J. & Singer, Marc " Unbundling the corporation", Harvard Business Review, 1999
[25] Eisenhart, K. M., "Agency Theory: An assessment and Review, 1989

On these assumptions, the focus of agency theory has been on determining the most efficient contract governing the relationship between principal and agent. In other words, it can be used to answer the question whether a fixed fee or outcome-oriented contract is more efficient. In a co-operation, such as a joint venture, agency costs (the cost for monitoring the other party in the agreement) rises significantly when the partners have different risk and time preferences. They are likely to disagree on scale of investment and whether to distribute or reinvest returns on it.

However, with a combination of incentives and monitoring mechanisms, it is possible to ensure that an agent's behavior remains consistent with the principal's objectives, and efficiency can be maximized.

Sengupta and Bucklin (1993)[2627] studied data from 98 different alliances and came to the conclusion that large gains in effectiveness can be made by reducing power and managerial imbalances. Moreover they found that when transaction-specific investments are high, power imbalances in an alliance can be reduced by increasing the level of contractual governance: formality, exit barriers, exclusivity and financial incentives.

3.5 Theoretical framework summary

To provide a basic understanding on how value is created for the end user of WLAN services and the venues role in this, the value chain by Porter, and theories on how it can be extended into a value constellation is explained. Motives for and the different forms of co-operations strategies from networks to outsourcing are sorted out, with the level of integration in the relationships defined.

Finally transaction cost economics theory and agency cost theory are elaborated, for use in dealing with how to make the different co-operations and networks work as efficient and profitable as possible. To complement the more recent virtual organization concept by Hagel & Singer (1999) will follow. Virtual organization should according to the authors be the answer to take advantage of the migration of the in the value chain caused by new technology and other drivers.

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[26] S.Sengupta, L. P. Bucklin "Organizing Successful Co-marketing Alliances", Journal of Marketing, 1993
[27] Interview with Sanjit Sengupta, 2001-12-14

General industry analysis theories	
Value Chain by Porter • A number of activities contribute to value creation for end-user	**Value constellations** • Value is co-created by a multitude of actors
Subject specific Theories	
Alliance and Network Theory • Motives for alliances • Strategic Alliances Vs Networks • Degree of integration	**Virtual Organizing** • Migration in value chain due to increase interaction costs • Virtual organizing increases efficiency
Agency theory • Minimizing distrust and monitoring costs • Increased formality benefits efficiency	**Transaction Cost Economics** • Ways to make transactions as efficient as possible • Minimization of opportunism by common ownership of assets

Fig 2 Summary of the theoretical framework

4 WLAN Market

This chapter contains information about the development of wireless Internet in general and WLAN in particular.

4.1 Demand

The WLAN technology is not new, as it has been around for use in offices for close to 10 years. What is new is the 802.11b standard (see definitions, 1.4) established by IEEE in 1999. IEEE is the organization responsible for establishing the Ethernet standard, which soon became dominant in the market. By issuing a common standard, public WLAN suddenly seemed to be very possible.

Currently the majority of WISPs targets the business travelers. According to the Yankee group, there is no doubt that the potential is there. In the US alone, 44 million employees take 243 million business trips each year. In dollars, that translates to $175 billion, which is spent by corporations on business travel. Airport delays alone cost corporations $794 million in lost time.[28] In a study by Andersen, a two-hour morning meeting by their consultants, where overnight travel is needed between two US airports, on average puts their people on the road for 26 hours[29]. This is due to the unreliable punctuality of airlines, something that is likely to worsen with the increased security measures after Sept 11.

There are several potential benefits with public WLAN, both the airport itself and the passengers. These include early check-in, increased service such as notifications when flights are delayed and increased revenues, as passengers are made aware of special offers at airport shops and restaurants.

Predicting development in a volatile industry such as WLAN is close to impossible, but as always there are lots of research companies trying to do just that. For example, Gartner group forecasts that number of users of public WLAN services (so called closed user groups, such as within offices etc not included) will rise to five million in 2003 and 20 million in 2006.[30] Today the estimated number of users are much lower however at between 20 000 and 100 000.[31]

4.2 802.11b specification

Before 802.11b emerged, there where a plethora of possible outcomes of the standards

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[28] Presentation by Mobilestar for WAA, “Business models and relationships”, 2001-01-19
[29] Andersen, Nortel, “Mobility in today’s economy..”, 2001-05-15
[30] Gartner Dataquest, “The public wireless LAN market opportunity”, 2001-05-31
[31] Analysis, ” Public Wireless LAN Access: A threat to mobile operators?” 2001

race, confusing the consumer on which to choose. One of the most popular standards was HomeRF, which earlier was backed by Intel amongst others. There have also been talks about building public networks with using the cable-replacement standard Bluetooth.

Although it is too early to declare the 802.11b the standards race winner, it seems very likely that it will do just that. Both HomeRF, and Bluetooth provide lesser transfer speeds and a narrower coverage area per AP, but most importantly they do not already have the large number of users 802.11b does. While both standards might find their users, it will probably not be in the public wireless Internet space.

4.3 Regulations

In difference to most other frequencies, for example 900Mhz and 1800/1900Mhz, most governments do not regulate the 2.4 Ghz band used by 802.11. This means that anyone can use it without the very costly procedure of acquiring a license from a regulator or government.

However some European governments have recently regulated the use of 2.4 Ghz in public spaces, likely as a measure to protect the carriers who paid enormous amounts for 3G licenses. In Europe the UK and France WLAN now require a license for use out in the open, but it is still allowed to deploy WLAN inside private property such as hotels. It cannot be ruled out that more countries will be influenced by this development however.

4.4 WLAN technological development

While 802.11b transfers data at up to 11 Mbps, the newer 802.11a specification promises speeds of up to 54 Mbps using the 5 GHz frequency. The 802.11g standard is an improvement of the 802.11b, delivering faster transfer speeds within the same 2.4 GHz frequency. Hardware supporting the newer standards is currently shipping, but has not made a larger commercial breakthrough yet. In addition the European HiperLan standard, a competitor to 802.11a seems to be loosing support from industry actors.

It is likely that 802.11b APs will be upgraded to one of the faster standards in a few years, but until demand for public WLAN has risen dramatically there really is no need for more capacity. Until then it will likely remain for use in “closed spaces” such as offices.

4.5 Security[32]

Many feel that security will be a problem for WLAN, saying that the technology is vulnerable to eavesdropping and unauthorized access. The 802.11b standard has a security

[32] CommWeb, ”Wireless Security”, 2001-11-05

measure called WEP (Wired Equivalent Privacy). WEP encryption is powerful, but many expert claims it was implemented in a way that undercuts its security.

However, there are ways to get WLAN network secure, by running a VPN (Virtual Private Network) across it for example. In fact, the US military considers WLAN to be sufficiently secure to have networks installed on some of their bases.

4.6 Alternative technologies

Although 802.11b seems to become the dominant technology for providing public Internet access, there are several other technologies that might complement it.

Especially in the US, proprietary technology (requiring a device specifically designed for the service) like Blackberry and the now folded Ricochet by Metricom has seen widespread adoption. Ricochet owners invested 300 million dollars and managed to gather 50 000 users before it ran out of funding (although new owners are talking of starting the service once again). These devices do not offer full Internet access but ability to receive and send e-mail. Perhaps time will show that e-mail is all people need while moving around, and 11 Mbps Internet access is ”overkill”. In fact, the new owners of what remained of Ricochet remains plans to reopen the service during 2002.

On the other end, UWB (Ultra Wide Band) a 20 year old radio technology provides lightning transfer speeds upwards of 10 000 Mbps or more, with a range of several kilometres. This is achieved by using a non-fixed fixed frequency, making it virtually impossible to eavesdrop. The big problem is that the use of UWB has yet to be allowed by the US FCC. As it is suspected to interfere with GPS signals the process may take time.[33]

4.7 Roaming[34]

Roaming between different WISPs are seen as vital to the public WLAN growth. The many small WISPs will not be able to get a sufficient “footprint” (area of coverage) for many business travelers to find their needs satisfied. In the GSM world roaming has been around for several years and it is now taken for granted by users that they can go anywhere there is GSM coverage and be billed afterwards by their home carrier.

A problem remaining to be solved is the different billing structures, where some WISPs charge by the minute and others have flat rate. This complicates the clearing between them.

Bilateral roaming

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[33] IDG, “Nygammal radioteknik utmanar 802.11b”, 2001-09-03
[34] BWCS, ” The wireless threat to 3G”, 2001

Roaming contracts signed between individual WISPs are referred to as bilateral. An example of a bilateral contract is the one signed between MobileStar and Australian SkyNetGlobal, where customers of both WISPs can use the other network free of charge.

Multilateral roaming

In the GSM world, signing bilateral roaming contracts soon became tedious work as the carriers had to keep track of new companies starting services in a multitude of different countries. After a while a central entity was created, where all companies who signed agreements with the central hub can roam with each other.

Excilan is a Luxembourg based company who aims to provide multilateral roaming and be the hub for WISPs to use. Besides not having to negotiate contracts with each and every WISP, an advantage towards using brokers is that the WISP will keep a larger part of the revenue itself.

Brokers

Brokers (who often refer to themselves as roaming partners) are companies who buy traffic minutes in bulk from WISPs and resell them to customers of their own. Some examples of brokers are:

GRIC[35] California based GRIC is a provider of global dial-up Internet access, via an alliance of over 300 ISPs and telecom carriers in 150 countries. The user is enabled to access Internet at local call rates wherever in the world he might be, and getting charged one bill by GRIC in his home country. In April 2001 it signaled its intention to extend the GRIC offering to include WISPs.

The business model is that GRIC buys a bulk of minutes from WISPs, and resells it to their customers. The downside for the WISP is that they receive significantly less for minutes sold to GRIC than they would in for example a bilateral deal with another WISP or their own customers for that matter.

Ipass Has a similar business model to GRIC, but with much stronger financial backing it is likely to have better staying power in the market.

HereUare The equally California based HereUare has a slightly more complex business model, where they are both an enabler and a broker of WISP services. Its eCoinBox software provides billing and authentication for WISPs, and its “jumpstart” program connects all of its clients into one network, where HereUare acts as a roaming entity. MobileStar and Wi-Fi metro (who shares ComVentures as financial backers with HereUare) are among the so far 20 WISPs using their services.

Virtual WISPs

A virtual WISP is a service provider who does not own infrastructure, but acquires access through agreements with one or several companies that do. Virtual operators are common in the cellular world, and a similar development may soon be seen in the WLAN industry.

In the beginning of 2002 the Sky Dayton, who founded ISP Earth link, started marketing the virtual WISP Boingo[36]. The company has access agreements with WISPs like Wayport and Surf and Sip, and offers its customers "sniffing" software to locate hotspots. Boingo aims to take full care of the customer relationship, branding all locations with their name. In the future Boingo thinks that most WISPs will merely handle the network access and not act as a front towards the public WLAN customers.

4.8 3G killer or complementor?

Although 3G theoretically should provide transfer speeds of 2 Mbps, according to analysts the actual speeds will be more in the area of 100-200 Kbps, which is far below the 512 Kbps limit which is minimum for a connection to be defined as broadband by many industry organizations.[37] Compared with WLAN which promise speeds of up to 11 Mbps, it seems very slow.

During 2001 many analyst reports suggested that WLAN might even make 3G unnecessary. This would be because of the WLAN infrastructure being much cheaper than 3G (especially since there are no licensing fees), with much higher transfer speeds. Lately such suggestions have diminished, and now the trend is to predict that WLAN will complement rather than destroy 3G.

WLAN does have some obvious downsides when compared to 3G. It is for example not advisable to use a WLAN connection while moving, as transfer speeds slows significantly, and established handover solutions between APs are lacking. Another problem can be found on the device side. Although PDAs such as the Compaq iPaq are being shipped with WLAN cards, the high-energy consumption is still a problem, making usage times very short. Using a laptop is to be preferred, and it will be several years before cellular phones will have the energy capacity required for WLAN.

Finally, 3G carriers point to the fact that WLAN currently is a data transfer technology only. Although trials have been made with VoIP (voice over IP) to enable voice for WLAN, it is not commercially available yet.

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[35] Interview, Mathew Perry, Business development manager GRIC, 2001-11-28
[36] Interview with Colby Goff, Manager of business development at Boingo, 2001-12-17
[37] Nomura, "3G is not broadband", 2001

Bundling WLAN/GPRS

While WLAN is unlikely to challenge 3G on its own, many feel that offering the technology together with GPRS is an interesting prospect. Telenor of Norway is doing it already, and VoiceStream aim to start such services after consolidation the acquisition of MobileStar.

5 Airport cases[38]

In this chapter the findings of the case studies performed in both Scandinavia and the USA is presented. The presentation of the cases follow a common framework with both the situation today and future strategy included.

Many US airports have recently experienced a sharp decrease in income from pay phones, due to the increased use of cell phones, something their European counterparts have seen for some time. The Atlanta airport alone has lost 7 million dollars per year in such income last year. [39] According to research firm Jupiter, "every airport is trying to figure out how to instead get a cut of the revenue from wireless"[40].

Case model

The cases begin with a description of the airports current solution (or lack of) for public WLAN and how the reasoning behind the decision went. Areas of interest include defining what company owns the infrastructure, who operates it and who gets the revenue. Also reviewed are business models used when contracting other external actors such as duty-free shops, restaurants, pay phone and cellular operators.

This is followed by the airport authorities future strategy and their thoughts on what issues are most relevant to be resolved for public WLAN use to take off.

5.1 Stockholm (Arlanda airport, ARN)[41]

The Arlanda airport is the largest airport in Scandinavia, serving Stockholm. Luftfartsverket (LFV), a government agency, who also manages 18 other airports in Sweden, operates Arlanda.

Situation today

During 2001, Telia Homerun (the WISP arm of telco Telia) has installed WLAN in public areas of the Arlanda airport. The agreement is non-exclusive, and Telia pays a fixed fee over a five-year period to the airport for the right to deploy their services. Telia own the infrastructure and will continue to do so after the five year period is terminated. There is no sharing of costs or revenue with the airport.

In addition Telia Homerun and Sonera has, through separate deals with the respective

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[38] Additional information about US airports at www.airports.com
[39] Computerworld, ”Airports ground use of wireless”, 2001-02-19
[40] Ibid
[41] Interview with Jan Egenäs, Head Controller, Luftfartsverket, 2001-11-13

airlines, installed WLAN in the Finnair and SAS lounges. The question on who decides over the lounges (the airlines or the airport) is however so sensitive that Egenäs declines to comment on it.

The fees for other external actors such as duty-free shops, restaurants etc. are fully revenue based. A revenue-based fee has been discussed with cellular GSM operators for a longer time, but has so far not materialized. Currently they pay a fixed fee per base station.

Future strategy

Jan Egenäs says that LFV is looking for the solution that generates the largest income, and if that equates to allow several WISPs to enter the airport, that is what will happen. Concerns about with issues such as service performance and reliability are in LFVs view best settled between the WISPs, rather than the airport. The customer for the airport is mainly the airlines; the travelers are a distant second. The main concerns are to create a good relationship with the airlines and maximize airport profits.

LFV is currently reviewing its strategy for WLAN, a project that is due to be finished early 2002. In the process, all strategies are reviewed. The possibility of operating the services themselves is considered interesting, and the Kastrup solution will be closely monitored.

Jan Egenäs believes the most pressing issue to resolve for WLAN to take off is lower prices. The 150 dollars per month or even the 10 dollar 24 card will in his view probably keep demand too low.

5.2 Helsinki (Vanda Airport, HEL)[42]

Finnish airports are operated by the FCAA, a similar organization to the Swedish Luftfartsverket.

Situation today

During the beginning of 2001, the FCAA conducted a "beauty contest" where the winner had to commit to install WLAN in all 25 Finnish airports within a year. The only WISP that where prepared to meet up to their demands where Sonera, the largest telco in Finland.

Sonera has as of November 2001 installed WLAN in three Finnish airports and will install in all 25 airports in Finland at the end of 2002. There is no sharing of revenue or costs and Sonera owns the infrastructure. It is a three-year deal (started summer 2001), but Sonera have exclusive rights only this year. All external actors, except cellular carriers pay revenue-based fees.

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[42] Interview with Toumo Huuppola, IT manager, FCAA

Future strategy

It is in Toumo Huppolas opinion likely that other WISPs will be allowed to install in 2002, and the FCAA are already in negotiations with them. While the FCAA are concerned with the interference problems of dual installations, they think that the WISPs are capable of sorting them out through sharing of infrastructure or other.

The FCAA and Helsinki airport has chosen not to become an operator of their own because it takes too much time and effort, and is out of their core competence. In Huppolas view the main issue to drive customer demand is to expand the WLAN footprint, with more hotspots and roaming.

5.3 Copenhagen (Kastrup, CPH)[43]

In difference to most other airports, the Copenhagen airport is privately owned and operated by Københavns Lufthavne A/S, a company listed on the Copenhagen Stock Exchange. Perhaps this is the reason to the rather innovative approach the venue has taken in their WLAN solution.

Situation today

CPH has entered into an alliance with Aptilo, a Swedish enabler. With the aid of Aptilo they have chosen to operate a public WLAN service on their own. The airport acts as the front to the customer, while the enabler Aptilo takes care of the service provisioning (including billing etc). According to IT-manager Henrik Bjorner Soe, the reason for this solution is that they did not believe that any specific company could get a worldwide coverage and a large enough customer base, given that no multi-lateral roaming solution exists in the market today. CPH owns the infrastructure.

Although passengers currently are able to use the service free of charge, the plan is to charge between 4-10 dollars for a 30-minute to 4-hour time period.[44].

Future strategy

In the long run CPH expects operation of WLAN of it's own to be more profitable than allowing specialized WISPs run it for a fee. The airport is currently negotiating with roaming brokers such as I-Pass and Gric to get access to the WLAN in CPH. Getting an effective roaming is the key for WLAN to take off in the view of Henrik Bjorner Soe.

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[43] Interview with Henrik Bjorner Soe, IT manager Copenhagen airport
[44] http://www.cph.dk/faelles/uk/wireless.asp, 2002-01-31

5.4 Oslo (Gardemoen, OSL)[45]

Like in Copenhagen, a privately held company (Oslo Lufthamn AS) owns the newly built Oslo International Airport.

Current strategy

The airport management have made the strategic decision to install and own the WLAN infrastructure. The reason is that they prefer to house multiple WISPs and considers several networks undesirable due to interference issues. The aim is to resell capacity with a fixed fee for the right of access plus a per MB charge on top depending on how much capacity is used. Negotiations are under way with Telia HomeRun (who operates under the name Netcom in Norway), Telenor and roaming brokers like GRIC and Ipass.

Management have been very firm in the relationship with airlines and other external tenants. Unlike in many other airports where the airlines have brought in WISPs of their own in their business lounges, no such activity has been allowed in Oslo. Telia HomeRun briefly installed several APs in some of the airport restaurants (pointing out that the service also might be accessed within a 50m radius outside the restaurants). But since they did not have permission from the airport management, they where quickly forced to remove them shortly after.

The other external actors in the airports pay revenue based fees, including the pay phones where revenue have been cut in half the last few years. The exception is cellular carriers who pay a fixed fee.

Future

The Oslo airport will not run the WLAN services on their own, as they thinks that specialized WISPs are better suited to the interaction with the end users. They do however recognize that if the current strategy is not working out, they can run the services themselves since they own the infrastructure.

Mårten Eldevik, the Managing Director of IT & Telecom at the airport thinks that increased security and lower prices combined with ease of use are the main obstacles to resolve for WLAN demand to take off.

5.5 Denver (DIA)[46]

The newly opened (1995) Denver airport differs from most other with regards to its size. The total area of Denver International Airport is 53 square miles, twice the size of Manhattan Island for example. This has implications for cellular carriers for example, who have no choice but to have their base stations on airport property.

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[45] Interview with Mårten Eldevik, Managing Director IT & Communications Oslo airport, 2002-02-07
[46] Interview with Jim Winston, Airport Information systems director, 2002-01-04

Situation today

Even though Denver begun a project to provide WLAN access for its passengers already in 1999, there is still no such service in operation. According the airport information systems director Jim Winston, in their initial survey of the market, Nokia was the only company who was willing to install WLAN at that time. However the terms of the contract was very attractive from the airports perspective:

- Nokia pays an undisclosed fixed license fee to install.
- After installment and start of service, the contract runs for one-year, after which the airport will own the infrastructure.
- If service did not start before February 2000, Nokia agreed to pay an undisclosed monthly penalty fee.

As of January 2002, Nokia have installed 53 access points. Initially Aerzone was contracted as a WISP, but they folded in 2001 and no other WISPs have been found. According to Wayport, the terms demanded have been too unfavorable[47]. In summary the Denver airport have infrastructure but no WLAN service, something Nokia is currently paying penalty fees for. It is unclear when a service might start. The airport does however have WLAN available in some of the airline lounges, through separate deals between WISPs and airlines.

Other external actors in the airport pay revenue based fees with some exceptions: In difference to other US airports the fees for operators of payphones are based on per passenger rather than usage, so the airport income from that area is increasing. The airport owns all infrastructures for cellular services, and all carriers pay a fixed fee to use it. The airport owns the surrounding land, which makes it impossible to beam in from the outside.

Future strategy

When the contract with Nokia is over the airport will own all communication infrastructures for both fixed and wireless voice and data. There is no interest to outsource to companies like Concourse communications (presented under 6.9), but rather bring in several WISPs and roaming partners, to allow the best service for passengers and profits for the airport.

[47] Interview with Kevin Curry, Wayport 2001-12-13

5.6 Seattle (Seattle-Tacoma International Airport, SEA)[48]

Situation today

Seattle-Tacoma International Airport is currently running a pilote study for public WLAN access through an agreement with Wayport. The agreement is non-exclusive and runs for two years only, with an optional one-year extension. There is a yearly fee paid by Wayport is based on number of how many passengers have passed through the airport that year. SEA has the option to purchase the infrastructure after the end of the agreement.

Other external actors in the Airport pay revenue based fees. SEA has a lease agreement with Qwest (formerly US West) for pay phones, which like the WLAN solution is based on the number of deplanements. Cellular carriers are not allowed to provide services on the airport premises.

Future strategy

The pilote study is part of a large wireless initiative to determine recommendation, options and alternatives for all wireless systems, due to be presented during 2002. Part of the wireless initiatives is the evaluation of cellular/telephony at the airport.

5.7 San Jose Airport (SJC)[49]

With its strategic location in the Silicon Valley, the San Jose has a very high percentage of business travelers, of whom a large percentage are early adopters of new technology like WLAN.

Situation today

The airport has contracted Wayport to deploy public WLAN in the airport terminals. Wayport has a five-year deal, but no exclusivity. For this Wayport pays for all infrastructure, and in addition pays an annual fee to the airport. The fee has been decided by the airport authorities, after a review of what a fair market value might be. All additional WISPs will pay the same fee. The airport have manage to mandate that Wayport cease to provide service and remove their infrastructure within 180 days should they want to install

[48] Interview with Julie Chen, Communications director SEA, 2002-01-10
[49] Interview with Charles Felix, Information Systems Manager at San Jose Airport, 2001-12-10

their own service. Wayport however, has no similar option to terminate the contract. WLAN is primarily viewed as a source of income rather than a value adding service to passengers.

In addition Mobilestar provides service in American Airlines lounges, and other airlines are also considering implementing solutions in their lounges. These are provided by the airlines, and are not under Airport control.

Storeowners, restaurants etc. pay a fixed annual lease for their presence in the airport. The same goes for cellular operators. Even though they in theory could "beam in" to the airport, most carriers have opted to pay to be in the airport.

Rents for payphones are revenue based, and income has decreased sharply the last few years because of increased cell phone use. SJC aims to recapture some of that revenue with WLAN services. There is no collaboration at all with other airports, even in the vicinity. Usually the different ownership structure and the number of people involved in a decision hinder a common solution.

Future strategy

The long-term goal is to have an own infrastructure and let WISPs use it. According to Charles Felix this is not going to happen before 2005 however, when a new terminal is built. The reason for moving slowly with the long-term solution is the uncertainty as to which technology will become dominant (802.11 a or b, Bluetooth etc.), SJC do not want to invest in infrastructure that will prove useless shortly after.

A complete provider of both voice and data is interesting and a solution that has been looked at. Talks have been made with Concourse and other actors. The loss of revenue in outsourcing is to be taken into account, but relief from the need of negotiations with vendors and lessened business risk is big plus. There is little interest from SJC to become WISP of its own; it is regarded to far from core competence.

The 802.11b needs to be established as a clear winner of the standards race, and inceased security to be in place before WLAN can become widely popular.

5.8 Oakland (OAK)[50]

Situation today

Oakland airport has no public WLAN service at present. The information systems manager Jeff Galtier explained that there are two main reasons for this. First, demand from

[50] Interview with Geoff Galtere, IT Manager, Oakland international airport, 2001-12-23

passengers for the service is slim. Secondly, the business models presented to the airport by WISPs are not viable; the revenue would not be enough for a WISP to survive for a longer period.

If Oakland where to deploy WLAN they would do it themselves, free of charge as a value added service to passenger. The reason they have not done this is that the se service is seen as a threat to current revenue in restaurants and shops. Like most other airports, all external actors except cellular carriers are paying revenue based fees.

The airport prefers that the travellers move around and spend money rather than sitting passively surfing the net. The traditional response to that issue by WISPs is that WLAN increases rather than cannibalise existing revenue from shops and restaurants, by advertising through an airport branded portal where passengers can be made aware of special offers, streamline check-in procedures an so forth. Galtier dismisses this theory; he claims that there are no workable solutions ready today that actually do all this. Moreover, he thinks that it is a zero sum game, where revenue gained somewhere in the airport has to be compensated by losses elsewhere.

Future strategies

Outsourcing is not seen as an attractive option. The agreements are too long-term, with contracts ranging over a 20-year period. It is not preferable to be locked in such a long time. It often leads to a less then perfect solution, and revenue losses are significant. For WLAN to take off, solutions for protection of existing revenue streams will be needed.

5.9 San Francisco (SFO)[51]

SFO is the main airport in the San Francisco bay area. Of its 40 million passengers yearly travelers, 30% are estimated to be business passengers.

Situation today

SFO conducted a rather remarkable auction in 1999, where the winner Aerzone offered 2 million dollars for a three-year exclusivity deal. Shortly after, and before a service was launched, the company folded. Wayport bought the remains of Aerzone, but backed out of the SFO contract as it was considered to be too expensive. The airport did not want to lower the terms of the contract to interest other WISP, which means that SFO at the moment has no service at all.

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[51] Interview with John Payne, Information system director SFO, 2001-12-12

Airport information systems manager John Payne says SFO did not want to lower its demands, since they are "not interested in putting in a service that does not last". If the WISP isn't prepared to pay the license fee demanded by SFO it probably does not have the financial strength necessary to be around very long.

The airport authority decides over both lounges and airport, but in practice other rules seem to apply. At least one airline (American) has installed WLAN in their lounge already, as the airport wishes for a common solution this is unwanted by them. But even though they have the right to prohibit the service and order it's removal, John Payne says they probably will not as they value a good relationship with the airlines.

Duty free shops pay a hybrid fee with a minimum fee plus a revenue-based fee. These fees have been re-negotiated to a significantly lower level after Sept 11, since many have been hard hit by the decline in passengers and also reside area where non-travelers are no longer allowed to be due to increased safety checks.

Pac bell, the company managing pay phones, pay fee based on the number of pay phones in the airport. As there is need for fewer payphones every year, SFO receives less income from these. Cellular carriers pay a fixed fee. The airport does not own the cellular infrastructure as it is considered to be unprofitable.

Future strategy

At the moment two major factors are missing; the airport does not feel that customer demand is there, and a viable business model has yet to show up from WISPs. Until a larger revenue stream can be seen, WLAN would primarily be used internally at the airport, the lounges are more natural places for the end user service.

Outsourcing have been looked at but been disregarded as an option. The main reason is that SFO wants to own the infrastructure within a reasonable time-span, and the 10-15 year contracts offered by outsourcing actors are too long. Outsourcing also means large offset of revenue. A solution similar to the Copenhagen airport, becoming a WISP of their own is not interesting either. The Information system department does not have the staff necessary. If the airport is to take part of the financing, the payback time must be shorter than what is possible today, which means demand must increase from current levels.

5.10 Las Vegas, (Mc Carran Airport, LAS)[52]

According to most several interviews objects in this thesis, Las Vegas Mc Carran airport has the largest and most competent information systems department of all US airports. That would indicate that this would be the airport most inclined to try a solution like Copenhagen

[52] Interview with Gerard Hughes, Sr. Network Analyst, LAS, 2001-12-20

airport, operation WLAN without the assistance of a WISP.

Situation today

LAS currently have no solution for WLAN. Gerard Hughes, Sr. Network Analyst of the airport, states that Las Vegas is primarily leisure destination. With demand for WLAN currently more or less isolated to business passengers, the airport authorities are in no hurry to find a solution.

All external actors pay a revenue-based fee. There are no cellular carriers present in the airport; the area controlled by LAS is not large enough so they have chosen to " beam" their service into the airport. Payphone fees are based on a per passenger count.

Future strategy

As demand is lacking, there will be no WLAN solution within at least two years. If LAS is to deploy public WLAN, Hughes says that they will have sufficient manpower and competence to handle it internally. Most likely an airport owned backbone would be provided, which multiple operators can roam into.

If the airport were to operate it on their own, it would be provided free of charge as a service to passengers. Outsourcing is not an option due to the loss of independence and revenue opportunities. The main obstacle for WLAN demand is an established clearinghouse/ roaming solution.

5.11 Miami (MIA)[53]

MIA has managed communication in a very different manner compared to other case airports. They own all infrastructures for both fixed and wireless voice, and charges the carrier's revenue-based fees to use them.

Situation today

The Miami-Dade County is actively involved in the settlement of all contracts, which slows down development significantly. This set up has contributed to the lack of a WLAN solution in the airport. Other external actors are charged hybrid fees with a small fixed portion combined with a revenue-based fee.

Future

[53] Interview with Howard Warner, Special Projects coordinator and Leonard Stout, IT-manager Dade aviation consultants, MIA, 2002-01-05

In line with its current policy with fixed and wireless, MIA wants to own the WLAN infrastructure from day one. In difference to most other case-airports, the aim is to find a solution where the airport receives all of the revenue and in turn pays a fixed fee to whatever organization is contracted to operate the service.

5.12 The NYC port authority

Unfortunately the NYC port authority have been severely hit by the events of Sept 11, as their offices where located in the WTC buildings. It has not been possible to locate suitable interview objects because of this. A case about their outsourcing deal will however be included anyways, since it is the most far reaching of it's kind so far in the industry. Information will be gathered from outsourcing partner Concourse communication and articles, with the lesser scientifical value this method implies in mind.

5.13 Airplanes as venues (case SAS)[54]

Public WLAN is not limited to airports; there are several trials with providing the service in-flight. After all many intercontinental flights are seven-eight hours or more in duration, where the passenger has little to do but to watch movies and sleep. Especially for frequent business travellers, turning idle time into work time might prove to be high in demand.

There are two companies working on providing WLAN in airplanes, Connexion a subsidiary of airplane manufacturer Boeing and Tenzing, partly owned by the Boing rival Airbus. Tenzing has a service available today, while Connexion will need some time to become fully functional. A distinct difference between the two is that Tenzing at present only enables the user to access a limited amount of websites, downloaded before takeoff. Also e-mails will be gathered and sent together every 15 minutes or so, rather than in real time. Connexion will in contrast provide a full-fledged real time broadband connection, however at a significantly higher price than the 4.95 flat rate used by Tenzing[55].

In-flight communication has been tried before. A few years ago many airlines installed satellite phones in every seat of their airplanes, but usage turned out to be very low. In most, if not all, of the cases an external company like Jetphone paid in full for the installation of the hardware, and in turn where to receive most of the revenue. Johan Eriksson, manager of SAS in-flight communications, says that the low demand for in-flight phones is due to increased cell phone usage. With prices in the range of 5-10 dollars per minute, few calls are urgent enough that they cannot wait until the plane lands. Another reason is that businessmen, who are probably the only ones prepared to pay the high prices, are reluctant to talk when surrounding passengers are able to catch every word said. SAS

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[54] Interview with Johan Eriksson, Manager of in-flight communications SAS, 2001-11-05
[55] "Boeing: Better Net access is worth the wait", Seattle Times, 2001-06-21

are currently removing the phones in the most of their fleet, with the exception of intercontinental flights, where one phone per airplane will remain.

Some lesson can be learned from the phone failure. It may be that demand for Internet in-flight will also be limited to longer flights, and security for corporate e-mail is also likely to be an issue. According to SAS, the Tenzing solution provides too low bandwidth for e-mails to be able to send corporate e-mails, something that they in contacts with companies like Ericsson and Nokia have understood to be unacceptable.

Regardless of the e-mail issue, SAS planned to initiate trials with Tenzing during early 2002. This test has however been cancelled by Tenzing after Sept 11, when claimed to have had to focus their efforts on trials already under way with Air Canada, Virgin, Singapore Airlines and Cathay Pacific (part owner of Tenzing). Other airlines, such as Finnair, have also put their WLAN trials on hold.

The high cost of WLAN deployment is a big factor in these delays. According to SAS, the infrastructure costs is close to 500 000 dollars per airplane. In addition a large satellite antennae have to be fitted, costing almost as much, to the outside of the fuselage (which also adds to fuel consumption). In all, almost 1 million dollars plus increased downtime for service and upgrades etc. Even though the goal of in-flight services is cost-neutrality rather than profit, which will be hard to achieve with WLAN at current prices. It is more likely that the equipment will come pre-installed with new aircrafts than fitting it into the existing fleet. In the view of SAS, widespread in-flight WLAN will not become a reality in the next few years in any of the major Airlines.

5.14 Lounges as Venues (Case SAS lounges)[56]

Several airlines such as American airlines and SAS for example have deployed WLAN in their business lounges, much to the dismay of many airports, as they would rather have the passengers use the WISP of their choice instead. The Austin airport has even forced American airlines to discontinue their service in their business lounge in that airport. Even though most airports value their relationship to the airlines too high to go those lengths, there is a clear tension surrounding the issue.

SAS claims to have the most extensive rollout, having equipped all of their lounges worldwide with WLAN through a deal with Telia HomeRun. Surprisingly there is no common solution within their Star Alliance in this issue, even though the members operate many of their lounges together.

The reason for choosing Telia HomeRun was simple; it was the only WISP willing to commit to the deal. Telia use the lounges free of charge, but pays for the infrastructure.

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[56] Interview with Lotta Rosengren-Edgren, Manager SAS business lounges, 2001-11-06

There is no revenue sharing with SAS.

At the time of contract signing, SAS was not aware of the possibility of running the service themselves with the aid of enablers. In the future such a solution is probable however as the company wishes to obtain a solution where they do not force a particular type of service on their customers, as well as maximizing choice. By becoming a WISP of their own and roaming with other actors such a solution will be reached.

6 WISPs

In this chapter all WISPs that operate in the case airports are presented. In the interviews with representatives from the companies, their relationship with the venues are mapped, as well as their thoughts about potential competition from venues, who like Copenhagen airport may chose to run WLAN services on their own. In addition, WISPs with interesting business models like Surf and Sip is presented.

6.1Telia HomeRun[57][58]

Current strategy

Telia HomeRun is a subsidiary of telecom carrier Telia. HomeRun is the only WISP Scandinavian with a Nordic wide coverage strategy. The company currently has 278 public hot spots in Sweden and 20 in Norway, but aim to have 800 at the end of 2002 all over Scandinavia. At the moment they mainly install in hotels, airports and conference centers, but also in railway stations, cafés and restaurants. The rollout is to "follow the business man" wherever he may go.

Current prices include three options: a 150 dollar flat rate, a hybrid 30 dollar per month plus 30 cents per minute or a 10 dollar 24 hour card. The prices are a lot higher than those offered by US WISPs. The difference is according to Carlo Cassisa at Telia HomeRun mainly due to the 25% Swedish sales tax, however it can be suspected that the lack of competition on the Swedish market is a contributing factor. To be fair it should be said that Telia's close to 300 hotspots is similar to that of the larger WISPs in the US, on a much smaller market. Cassisa also argues that Copenhagen airport will have similar prices to Telia, although they only provide one hotspot.

Relationship with venues

The contracts with the venues generally span over five-year period. In many cases there is no exclusivity to the venue. At the moment HomeRun have deals with the two main airports in Stockholm, the international Arlanda and small domestic Bromma airport. HomeRun pay the owner Luftfartsverket and undisclosed yearly fixed fee, and finances the infrastructure (for Arlanda a costs of about 100 000 dollars). There is no exclusivity right to the airports.

According to Cassisa, it is not their strategy to share revenue and costs, at the moment, and if they can avoid doing it they will. It will only be done if the venues start to demand it. HomeRun only pay licensing fees to the very attractive venues such as Arlanda.

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[57] Interview with Carlo Cassisa, Director of Business development and export, 2001-11-20
[58] www.homerun.telia.com, 2002-02-03

Cassisa feel that the venues generally are not aware of their market value. Most of them are just happy to get the service and have not thought of the fact that HomeRun might actually make a profit, of which part could be theirs.

Future

HomeRun does not feel that niche players are a threat as a competitor, as they occupy space they do not desire such as cafés. These actors are instead potential roaming partners for Telia. A more serious issue would be if the Copenhagen Airport model would prove popular. The most attractive venues are in that case most likely to go for that model, and would hence decrease overall quality of the HomeRun access footprint.

As HomeRun already is in far reaching discussion with major WISPs around the world, Cassisa is certain that roaming will take off in 2002. Adoption of public WLAN will increase when the technology grabs a stronger hold of them home and office market, it will then become natural to require the service also when traveling.

6.2 Jippii group[59]

Current strategy/Future

Jippie group originated as a Finnish ISP in 1994. After buying up a diverse group of other companies in different European countries during 2000, ranging form cellular carriers to Internet portals, it now calls itself a "multi service operator". In early 2001 it spun off a separate company for its WLAN operations called WNS. WNS announced plans to roll out "thousands" of WLAN hotspots all over Europe. However, after initial trials with 100 hotspots in some 50 Finnish cities, plans are currently revised, and WNS have been folded back into Jippii group

According to sales director Jan Lindberg, WNS were able to sign up about 1000 WLAN customers, paying 350 Finnish marks (about 60 dollars) per month, which was not enough. Jippie group does no longer think that WLAN alone is a viable business model and the current plan is to bundle WLAN with ADSL and cellular services.

6.3 Telenor[60]

Telenor started its WLAN rollout in April 2000 and currently have 32 hotspots.

Current strategy

For Telenor, WLAN is a complement to GPRS, and the two services share a common price

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[59] Interview with Jan Lindberg, Sales Director Business Services Jippigroup, 2001-11-13
[60] Interview with Håkon Himle, Telenor, 2002-02-06

structure. In difference to almost all other WISPs Telenor has chosen to charge per MB downloaded, with the per/MB price decreasing the more a customer downloads. There is also a 24-hour card, but no monthly flat rate.

Telenor pays the full cost of the infrastructure, but no additional fees to the venues. To stimulate promotion of the service, venue owners get a cut from the 24-hour cards sold at their location. Telenor does not think that exclusive rights are very important, WLAN manager Håkon Himle says that they rather compete with service quality such as their ability to bundle GPRS and WLAN.

The WLAN rollout will be limited to Norway, but wants to extend their service into other countries through roaming.

Future

Venues becoming WISPs is not seen as a threat. Telenor does not think that they will be able to run the service efficiently enough, and without economies of scale, it will not be cost efficient enough either. Roaming is interesting, but different price structures have to be reconciled.

6.4 Sonera[61]

Current strategy

Sonera is the largest telecom carrier on the Finnish market. As a preemptive move the choice has been made to enter the WISP industry, rather than having new independent companies seize the first mover advantages. As of November 2001 Sonera have 50 hotspots, and estimate that they at the end of 2002 will be about 200.

Preferred venues are conference venues, hotels and airports. Sonera currently only targets the Finnish public WLAN market, although they have a hot spot in the Finnair Lounge at Arlanda as a test project. They aim to expand their footprint through roaming rather than installations of their own.

Through a deal with FCAA (Finnish airport authorities), Sonera has installed WLAN in 9 airports and will install in all 25 Finish airports by the end of 2002. There is no exclusive right to the airports; something Sonera claim is not a major concern for Sonera, as they have made it clear to the venue owners the technical problems (disturbance etc.) involved in having several WISPs at the same spot. At the moment only monthly contracts exists costing 2 dollars per month + 20 cents per minute. 24 H cards will be offered, but the price

[61] Interview with Lara Saolo Business Manager Wgate, the Sonera WLAN solution, 2001-11-19

of them is unclear.

Relationship with venues

Sonera has not seen demand from venue owners regarding revenue and cost sharing. According to them the venue owners mainly see WLAN as a service to their customers rather than something to profit from. If and when the demand is there, Sonera will look at revenue/cost sharing as a possibility.

Sonera believes that there is a first mover advantage in WLAN, and also that there is a clear competition between WISPs to sign the most attractive venues. Airports are no 1 regarding attractiveness of venues, but conference centers and hotels is needed to get a competitive coverage. Cafés and restaurants might also be of interest.

Future

Sonera does not consider the idea that venues will become WISPs of their own a big threat, as WLAN is too complicated to deploy for the venues to actually consider it. Roaming is essential, without it WLAN will not take off in public.

6.5 MobileStar[62]

In October 2001 the high profile WISP filed for bankruptcy. The US cellular carrier VoiceStream (owned by Deutsch Telecom) shortly after entered into an asset purchase agreement with MobilStar. Under this agreement, VoiceStream will have the right to acquire up to all of MobileStar's equipment and assume some or all of MobileStar's contracts. The agreement is subject to review and solicitation of competing bids by the bankruptcy court.

During the interim VoiceStream has agreed, subject to certain conditions, to provide DIP (debtor-in-possession) Financing to MobileStar. This DIP financing will enable MobileStar to continue to provide uninterrupted service to the customers

According to VoiceStream spokesperson Kim Thompson, MobileStar's will complement VoiceStream's nationwide GSM/GPRS network and offers VoiceStream customers additional access to WLAN at "extra high traffic locations" such as airports, hotels and conference centers.[63]

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[62] Interview with Ali Tabassi, CTO, Mobilestar, 2001-12-14
[63] Interview with VoiceStream spokesperson Kim Thompson, 2001-12-01

Current MobileStar strategy

Mobilestar has around 700 hotspots at the moment, divided into

- 550 Starbucks
- 120 hotels
- 35 lounges
- 5 airports (mainly smaller regional airports like Dallas, Austin, Louisville, Burbank and Sioux falls)
- A number of American Airlines airport lounges in the US.

MobileStar wants to highlight that they have a different way of charging customers that its main US rival Wayport, who charges individually per hotspot. In other words, a 24-hour subscription does not mean you can use Wayport in two of their airports the same day. A similar MobileStar subscription will get the user access to all their locations nationwide.

In difference to Wayport, who prefers flat rates, MobileStar thinks customers would like to pay by the minute for WLAN, as that is what they are used to from their cellular subscriptions. While such a pricing model may create problems for roaming with WISPs who charge fixed fees, Mobilestar believes that the largest "footprint" will eventually decide which model will preside.

Ali Tabassi[64] claims to be very open to roaming, as long as the networks meet their minimum requirement with regards to customer service etc. As the number of WISPs is limited, there is still little need for a multilateral roaming organization. Bilateral roaming deals are more flexible in the MobileStar opinion. A deal was made with Ipass in 2001 but where withdrawn because “they did not deliver”.

Relationship with venues

The desire by MobileStar for exclusive rights to a venue differs according to which business model is used. If Mobilestar are to pay for installation and operating cost for a network, the preference is to have exclusivity. Usually MobileStar continues to own the asset after the contract period expires. The exception is some of the airports, where the authorities get ownership.

As is the case for Wayport, revenue sharing contracts are made with hotels, but not at airports. There are two revenue sharing plans, while one hotel might get part of the 24 -

[64] Interview with Ali Tabassi, CTO, Mobilestar, 2001-12-14

hour cards they sell, others may receive revenue sharing linked to the number of customers at the site, regardless of where the subscription is sold. When costs are shared, so are revenues, and MobileStar has not been able to negotiate such contracts with airports yet. The time-span of contracts is generally 3-5 years.

The attractiveness of the venue clearly shows in the business model used. What makes a venue attractive for WLAN is not takes some research to establish. For example airports with a lot of local travel can be more valuable because they hold a lot of frequent flier travelers (Austin/Dallas example). Three different types of arrangements are made with venues, depending on their attractivess: the venues that receive payments and infrastructure, those that only receives infrastructure and venues who gets subsidized infrastructure.

Mobilestar sees the desire from venues to own and in some cases even operate the WLAN infrastructure as a positive development, as long as they are allowed to roam. The company feels that the obligation to provide the infrastructure is a big resource eater that they would like to not be involved in.

Future

MobileStar thinks that the larger cellular carriers will enter the WLAN arena within a few years, most probably, in similarity to VoiceStream, by acquisition of independent WISPs like MobileStar and Wayport. The hesitant position by the carriers so far is in the opinion of Tabassi due the unclear situation with 3G in the US. It has only recently become evident that 3G is not going to become a reality until at least a few years more. To get a sufficient coverage of WLAN hotspots in the US is such a big commitment that the carriers have not been able to handle in parallel with a potential 3G investment.

6.6 Wayport[65]

Current strategy

Wayport currently have hotspots in 450 hotels and 4 airports (Seattle, San Jose, Dallas, Austin).

The price structure consists of flat rate only contracts. Currently a monthly contract is 30 dollars/month but larger corporations can get lower rates such as 20 dollar per month. A 24-hour card is also available. Wayport is considering the offer of 1-hour cards, as it would facilitate roaming with other WISPs who often have per minute based pricing. To roam a 1 hour card may be offered, but not a per minute based contract.

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[65] Interview with Kevin Curry, Director of Business Development, 2001-12-16

Wayport is certain that roaming is coming in 2002. It remains to sort out how to manage the WISPs different billing structures however. The largest competitive advantages of Wayport is their 24/7 service, not footprint or price

Relationship with venues

Revenue and cost sharing is taking place at some Wayport location, but not in airports. The percentage of cost and revenue sharing is different depending on the attractiveness of the venue and ranges from 90/10 to 60/40. Payments to and/or revenue sharing with venue owners are a large part of Wayport expenses, the venues are increasingly aware of their market value. The cost to outfit airports with WLAN infrastructure ranges from 200-500 000 dollars, depending on the size of the venue.

Wayport is not looking for exclusive rights contracts; the high costs associated with those types of contracts are not worth the extra value. This is part of the reason it backed out of the contract with SFO they received after acquiring the remains of Aerzone.

Future

Currently independent WISPs like MobileStar are the biggest competitors, but soon Wayport expects the larger cellular carriers to enter the arena, likely through acquisitions. The risk of venues becoming WISPs of their own such as Copenhagen is not considered a threat, the knowledge is simply not there.

For WLAN to take of the key issues to resolve is devices and roaming, in combination with increased market awareness by customers.

6.7 Surf and Sip[66]

Surf and Sip is not targeting airports, but is included it the thesis because of its innovative business model, where they have managed to shift most of the financial burden of infrastructure costs over to the venues.

Current strategy

The company has about 100 hotspots today, and according to CEO Rick Ehrlinspiel there is no particular strategy concerning type or location of venue. When a good opportunity comes up, they seize it. A difference to the larger WISPs is that Surf and Sip do not target businessmen. This means that they have to outfit the venues with rental computers, as it cannot be assumed that the customer will bring their own.

The pricing is 20 dollars per month, or 6 dollars per hour, with a 50% discount if the

[66] Interview with Rick Ehrlinspiel, CEO Surf and Sip, 2001-12-05

customer uses their own computer.

Relationship to venues

Surf and Sip co-operates with venues over a 5-year period. The cost of fitting small café with infrastructure is just 700 dollars, a sum paid entirely by the venue, which gets ownership of the infrastructure after the contract period is over. In turn the venue can share revenue streams by getting part of income from the 15-minute cards they sell. Rick Ehrlinspiel does not feel that the venues are aware of their market value, and generally are just satisfied with getting service.

Surf and Sip has a very active stance on roaming and have already signed deals with HereUare and Boingo.

Future

Surf and Sip aims to become a virtual WISP, providing service but not having to bother with infrastructure issues or relationships with customers. The shops are to take full responsibility in generating new customers. The key factors to resolve are public awareness of the existence of public WLAN services.

6.8 Wi-Fi Metro[67]

Wi-Fi Metro took over what remained from a bankrupt WISP called Airwave, and has been active since Nov1 2001. At the moment it is incubated by its financial backers, VC group ComVentures. ComVentures also has interests in the enabler and roaming broker hereUare.

Current strategy

Currently only targeting the SF bay area. After a viable business model has emerged a larger rollout across the US is planned. Questions remaining to be answered are for example where and how dense users want the hotspots to be. The network currently consists of 40 hotspots only. Wi-Fi metro is initially targeting all segments from students, coffee shop visitors, to businessmen. Would like to have some airports in the future.

The price plan consists of a 19.95 flat rate per month only. Per day or per use payment presents problems for both the user and the WISP, since transactions cause paperwork and not relations, which is the priority.

Wi-Fi metro uses different cost and revenue models, but they always have ownership of the infrastructure. Roaming is not a priority at this point in the development of the company. If roaming where to be utilized, it would be with WISPs with different venue strategies than

[67] Interview with Arturo Pereyra, General Manager Wi-Fi Metro, 2001-12-14

Wi-Fi metros, such as Wayport.

Future

Once General manager Arturo Pereyra has figured out which business model to use, the plans are to rollout 50 additional hotspots nationwide. They are likely slated for deployment at the end of 2002.

Key success factors are embedded and preinstalled WLAN technology in devices, increased footprint, and security.

6.9 Concourse communications[68]

Concourse communication is a "neutral host outsourcing partner". The company takes full responsibility of the venues communication need, subcontracting all voice and data between 800Mhz-5Ghz, which includes both cellular and WLAN services. The perceived advantage for the venues is that they receive "turn-key" solution with guaranteed service. Concourse also makes a case of having previous relationships with carriers and WISPs. The need for time-consuming negotiations with each and every different service provider is no longer a concern for venues. For the operators the sharing of infrastructure supposedly gives lower cost, than should each provide its own.

They big drawback mentioned by venues is the steep loss of revenue that instead benefits the outsourcing partner.

Current strategy

At the moment Concourse take full ownership of the infrastructure, but the company is working on trying to share this responsibility between both venues and service providers

The business model is a bit more complicated when it comes to providing WLAN, than other co-operations in the industry. To start, Concourse shares some of its revenue with the venues. They charge a fixed fee from the broker Ipass (does billing and authentication), who in turn who charge by the minute to contracted WISPs such as Wayport.

During 2001 Concourse landed a deal with the NYC port authority during 2001, where they where awarded the responsibility to solve communication issues for all of the airports in the area (La Guardia, Newark and JKF) and other port authority property. Similar co-operations are in place with Detroit and Minneapolis airport authorities. Concourse has executed long-term access agreements with AT&T, Verizon, VoiceStream and Nextel for

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[68] Interview with Dick Snyder, Manager Business development, 2001-12-10.

telecommunications, and MobileStar and Wayport for WLAN.

As of yet however, Concourse has not installed any WLAN infrastructure. A trial in Minneapolis has begun, and will take four months. Within a year 20 hotspots is estimated to be available. Concourse is targeting only airports at this time, as they are a small company and need to stay focused.

Outsourcing deals are long affairs; the NYC contract is for 15 years with two 5-year renewal options. Concourse says that 10-year contracts are the minimum they are interested in. However the Minneapolis is for 5 years only, but with a 5-year renewal. Detroit is 10 years.

Future

Concourse has not seen any competitors offering these types of outsourcing solutions as of yet, but expects the larger system integrators like EDS and IBM to do so within short.

Venues becoming WISPs of their own is not seen as a threat as the competence is too limited competence. However Concourse believes that there is a trend towards revenue based partnerships with venues. A key issue is awareness which is regarded as a huge problem, another is the penetration of VPN (Virtual Private Networks), currently only at 65% of US companies.

7 Analysis

7.1Types of WISP/Venue alliances and networks used in case airports

Exclusive right contract

Several co-operations offer exclusive rights to the venue for the WISP involved. The perceived benefit for the WISP would be to get a more attractive "footprint" (area of coverage) to target customers, giving a competitive advantage towards other WISPs. The upside for the venues would be that they could charge an additional amount of money for this right, and hence extract maximum value for their role in the public WLAN value chain. In some cases, such as the San Francisco international airport, the fee was set so high that the WISP backed out of the contract and left the venue with no WLAN service at all.

These contracts usually ranges over 3-5 years, but with roaming between WISPs becoming likely in 2002-2003, the value of exclusive rights is being questioned. When all actors can get access to the "exclusive" venue, the advantage is gone.

Non-exclusive contracts

The most common type of co-operation does not involve a formal exclusive right, even though there is only one WISP present in the venue. However, these agreements commonly include an agreement that the venue may get ownership of the WLAN infrastructure after the contract period expires, either free or for a low compensation. This may act as a sufficient safeguard against allowing more WISPs to enter the venue. After all, the airport knows that several networks at once cause interference and lower transfer speeds.

Multiple WISPs

Few venues have opted to allow several WISPs to deploy their services, although many express the long-term goal to do so. There are several reasons for this: while all of the WISPs pay fees for the right of presence, the total amount received usually is less than what can be reached for an exclusive rights contract.

A technical problem that needs to be resolved is that of interference. If several APs are deployed by different WISPs in the same area, quality of service and transfer speeds decreases significantly. Interference can be solved by making WISPs share a common infrastructure, or by roaming. In reality the need to resolve ownership issues etc, makes this a very complicated solution however.

Venue is WISP

As WLAN is relatively cheap and not regulated, it is possible for a venue to simply buy infrastructure and operate it themselves. Several companies, such as the Swedish Service

Factory[69] and US hereUare for example, offer complete solutions for venues with infrastructure and service provisioning. These solutions include billing towards end user and other necessary functions.

This means that the venue does not need to worry about the management of the service, but receive 100% of the revenue. A wider area of coverage can potentially be obtained through roaming. Although this might be seen as an attractive solution at first glance, Copenhagen is the only of the case airports that has chosen this solution. The venues are either unaware of the ability to run a service of their own without much effort, or feel that bringing in a WISP will be more profitable or involve less financial risk.

Outsourcing

Outsourcing is the contracting out of non-core activities of a company to specialists. It differs from contracting in that outsourcing is a strategic management tool that involves the restructuring of an organization around what it does best.

The outsourcing solutions found in this thesis included both voice and data, where the contracting party takes ownership of the infrastructure and in turn sub-contracts WISPs and carriers to use it for their services. The upside for the venue is that they do not have use manpower on non-core activities such as keeping up with technological changes and negotiating contracts with a multitude of different actors. A big downside is that they often limit their income from these services severely.

A major difference in outsourcing deals compared to other co-operations found in the empiric studies of the thesis is the time span of the deals. An outsourcing contract typically spans for 10-15 years, in difference to the 3-5 years found in exclusive rights contracts for example.

[69] Interview with Claus Clausen, CEO of Service Factory, www.servicefactory.com, 2001-11-18

7.2 Summarized findings, US airports

X = Undecided - = Not applicable

	DIA	**SEA**	**SJC**	**OAK**	**SFO**	**LAS**	**MIA**	**NYC**
WLAN Infrastructure	Yes	Yes	Yes	No	No	No	No	Yes[70]
Public WLAN operational	No	Yes	Yes	No	No	No	No	No
WISP Involved	Nokia[71]	Wayport	Wayport	-	-	-	-	Concourse[72]
Exclusive rights contract	Yes	No	No	-	-	-	-	No
Wants multiple WISPs	No	X	No	X	No	Yes	Yes	Yes
May become WISP of their own	No	No	No	No	No	Yes	Yes	No
Revenue based fees	No	Yes[73]	No	No	No	Yes	Yes	No
Ownership of infrastructure desired	Yes	Yes	Yes	X	X	Yes	Yes	No

Fig 4

About half of the US case airports have WLAN infrastructure in place, but only two have operational service. Few are considering to operate the service on their own, but this fact

[70] Will be implemented during 2002
[71] Nokia has yet to find a WISP to operate infrastructure
[72] Concourse will subcontract WLAN service to several WISPs
[73] Revenue sharing is based on amount of passengers, rather than on actual usage

may also be due to lack of knowledge of the possibility to engage a enabler who virtually takes care of all technical issues. Almost all prefers to own infrastructure in the long-term.

7.3 Summarized findings, Scandinavian Airports

X = Undecided - = Not applicable

	ARN	**HEL**	**CHP**	**OSL**
WLAN Infrastructure	Yes	Yes	Yes	Yes
Public WLAN operational	Yes	Yes	Yes	In negotiations
WISP Involved	Telia HomeRun	Sonera	Aptilo[74]	Multiple
Exclusive rights contract	No	Yes[75]	-	No
Wants multiple WISPs	Yes	Yes	No	Yes
May become WISP of their own	Yes	No	Already is	No
Revenue based fees	No	No	Yes	Yes
Ownership of infrastructure desired	No	No	Yes	Yes

Fig 5

[74] Aptilo delivers infrastructure and billing only, CHP is front to the customer
[75] For the first year only

Cellular value chain Vs WLAN value networks

The Scandinavian airports all have WLAN service except for Oslo, who are in negotiations and will start this year. They are dived on ownership of infrastructure and whether to share revue and costs.

The creation of value in the WLAN industry differs from that found in most other parts of the communications industry. Significant value migration has occurred and it is far from over, it is still unclear who will have the relationship with the end-user for example. Virtual WISPs such as Boingo, independent WISPs, roaming companies and telecom carriers are all aiming for that role.

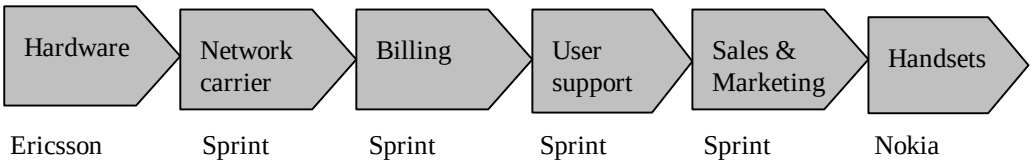

Fig 6, A typical cellula value chain, with example of actors at each stage

While this is a simplified version of the actual chain, the point is that there are clear and defined roles in the value chain, where the cellular operator (in this case Sprint PCS) handles the majority of the tasks.

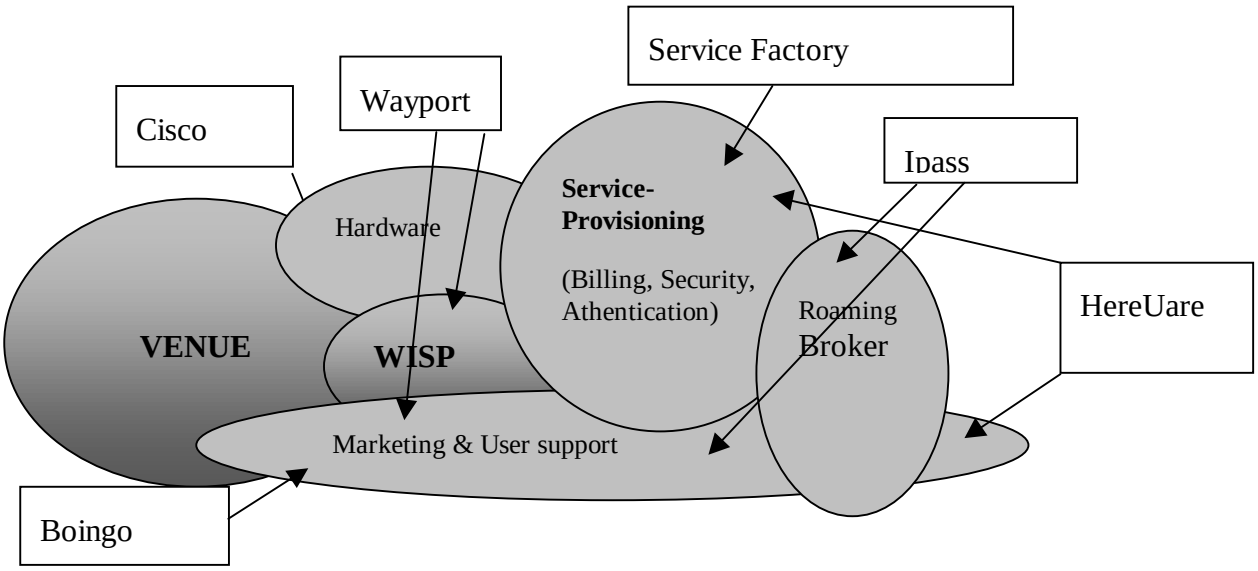

Fig 7, A WLAN value constellation, with the venue occupying a vital position

In the WLAN industry a multitude of new and sometimes unexpected actors are involved in

the creating of a customer offer. A value constellations perspective is more relevant when explaining this dynamic process, where all actors co-operate and depend on each other. The venues hold a very strong position in the constellation, since clearly no service will come about without their consent.

Virtual organization

The theory of virtual organization by Hagel (1999) seems very applicable to the public WLAN industry. In most cases at present, the WISP has been handling all three of the businesses (product innovation, customer service and infrastructure) which the author claims should be separated. It has not proven to be the best solution.

If the theory is applied to the WLAN industry, the customer relationship and product innovation businesses are not to be handled by the venues (in this thesis airports). Besides that both these activities are far from their core competences, most airports authorities have expressed the view that their main customers are the airlines and not the passengers, who comes as a very distant second. This attitude makes managing a close relationship to passengers, and developing attractive products and services for them difficult. The WISPs are far better at product innovation, putting together an attractive network of hotpots with the most up to date technology. The relationship to the end-user is however a different story, perhaps better handled by the larger cellular carrier or virtual WISPs such as Boingo or roaming brokers like I-Pass. With their larger customer base and experience of how to relate to them they are well equipped for the task.

Remaining of the three businesses are infrastructure management, which is best managed by the airport perhaps with the aid of a third party. In fact the core competence can be considered to be infrastructure and property management. The task of having to install, manage and finance the infrastructure has proven too much for many WISPs. They would certainly benefit greatly if they were able to focus more of their manpower and capital on enlarging their customer base instead.

After an initial unbundling of activities, Hagel suggested horizontal rebundling into new and more efficient forms. These may for example include specialized third party integrators who can manage and install the infrastructure, minimizing the effort required by the venues. While virtual organizing is likely to improve allover efficiency of the operations of the WLAN service, it still leaves the question of how the revenue should be divided. Sharing of revenue is still largely not done in the industry, but needs to increase if the venues are to be enticed to take larger responsibility in the financing and managing of infrastructure.

Alliances and networks

The co-operations formed so far cannot be referred to as alliances according to Childs (1995) as they lack common ownership completely, which also is in line with the reasoning of Johansson and Mattson (1991) that networks generally exist for reasons stemming from

resource-dependency. This is clearly the case with the venue providing vital resources for the WISPs, and it can be concluded that network theory better describe the WISP/ Venue relationship.

Network relationships

The most common agreements were those who Child and Faulkner (1995) referred to as unilateral agreements and the dominated network. The unilateral agreements are typical for the public WLAN industry where one firm (the WISP) has a product and another (the venue) market access. The dominated network is where the dominant player surrounds itself with a wide and varied network of subcontractors, and all the institutions involved regard the network as a kind of family, with the hub company as the head. Such a network is typical for an airport, and while few had co-operations with more than one WISP, their clear intention were to head in that direction.

The network forms defined by the authors with higher level of integration, such as virtual corporations and the strategic alliances, was not utilized by the researched venues. Should the venues follow the recommendations in this thesis however with sharing of the cost of infrastructure amongst other things, an equity joint venture may be formed which is a form of strategic alliance.

Minimizing transaction costs in the WISP/ Venue relationships

The choice of partners for both venues and WISPs are limited, the degree of asset specificity is high and the time-span for maturity of the investment is relatively long. Combined with the complex and rapid changing state of the WLAN market the possibilities of opportunism and information impactedness are high. The need for contractual and organizational safeguards increases. A market structure will not provide enough safeguards; a hierarchy or better still hybrid structure is to be preferred in the TCE perspective. The most vulnerable actor, in this case clearly the WISPs, is obviously the greatest beneficiary of more safeguards in the short run, but overall efficiency would also improve.

A hierarchy would in this context be the solution chosen by Copenhagen airport, where the WLAN services are embedded within the organization. Hybrid governance is characterized by bilateral dependency between the partners, where the two parties mutually commit to equity and assets, and agree on cost and profit sharing. In contrast to hierarchies in which one set of owners and/or managers have unilateral authority, the partners to hybrids share rights to control and monitor activities, thus potentially weakening the control each can exercise. To overcome this problem, the partners have to rely on features such as long-term contracts, the offering of mutual hostages such as assets specific to the collaboration, and the development of mutual trust. Contractual safeguards include exit barriers, exclusivity and financial incentives.

Differences between Scandinavia/ USA

The WISP market is very different in the two areas, where the US actors are all newly formed, mainly venture backed, specialized WLAN providers. While such WISPs do exist also in Scandinavia, the dominant players are all large telecom carriers like Telia and Sonera. There are several advantages for a carrier in an industry like this, besides having the deep pocket it takes to stay until demand picks up. These advantages include the possibility to bundle WLAN with GPRS or 3G, an existing customer base (and experience with how to handle the relationship with them), and last but not least, a pre-existing relationship with venue owners. There are signs however that the US carriers are getting more involved in the WLAN development, with the VoiceStream acquisition of MobileStar being one example.

Most of the WISPs primarily target businessmen. In that light it was interesting to note during the interviews the great difference in the attitude towards business expenses between the researched areas. US companies seems more price sensitive than their Scandinavian counterparts, although monthly rates are up to five times less than those offered by Scandinavian WISPs. Representatives of WISPs in the US where concerned that only top-level executives or employees who travel very frequently will be granted a monthly WLAN subscription.

Different tax levels can perhaps explain the discrepancy in attitude. A deductible business expense is seen as by many Scandinavian companies as a cheap way to motivate its employees. Paying a similar amount as salary to would be much more expensive, a multitude of benefits such as free cell phone bills is often commonplace for a Scandinavian white-collar worker. The result is increased demand for per hour rates in the US, so that every WLAN expense can be attributed to a specific business trip, enabling higher cost control.

7.4 Conclusions

The main conclusion in this thesis is that venue owners, to improve overall efficiency and long-term profitability for both themselves and WISPs, should take a larger part of the financing of public WLAN deployment. As compensation for the increased business risk, ways of sharing of the revenue stream generated should be evaluated. Even though the venues in the short term might be able to obtain a financially attractive solution, without taking any business risk, they will have to find a different model in order not to force their WISPs out of business. In the long run it should be in the venue owners interest to get a cut of the revenues as these are projected to far outweigh the capital cost for infrastructure.

Increased financial risk and revenue sharing will also create motivation for venues to market the service properly, an incentive virtually non-existent today. In some airports, the management have even expressed the view that extensive use of WLAN by passengers is

undesirable. They would rather have them spend their idle time eating at restaurants and shopping, where the airport does profit from revenue-based rents.

7.4.1 Revenue and cost sharing proposition

With a single WISP/Exclusivity contracts

The amount of revenue sharing should of course be put in relation to how much of the capital costs are shared. There are two basic ways to start the revenue sharing under shared infrastructure ownership. The easiest and most obvious is to let the venues keep part of the income from 24-hour cards sold on-site. The next step may be to also negotiate to get a share of the minutes used in the venue by flat-rate customers.

To decrease business risk and increase overall efficiency, longer contracts should be made. Another proposition is to include a minimum revenue clause. If revenue does not surpass the lower limit, no fee is paid to the venue. Such an arrangement creates mutual interest to get the WLAN service off to a good start, and works to increase trust between the actors.

With Multiple WISPs

A solution that lacks some of the benefits of a hybrid solution such as mentioned above is if the airport decides to take full ownership of the infrastructure, such as Oslo airport has done. However, it is clearly the way to go if multiple WISPs are to operate in the same venue. The transaction costs of monitoring common ownership of infrastructure involving more than two actors would simply be too high.

The proposed strategy in Oslo may very well serve as a model. A fixed “sign-up” fee creates an exit barrier, while a variable cost is charged depending on usage.

7.4.2 Minimizing transaction costs

There are several factors found in the case studies that have contributed to high transaction costs, making payback very difficult for the WISPs:

- Too short contracts

With contract generally no longer than 3-5 years, uncertainty is very high if demand will pick up in time to make payback possible for the WISP.

- No sharing of costs and revenues = no common interest in marketing the service
- Vague long term plans increase business risk

The venues have no long-term plans for WLAN. Some have made clear that they might cancel the deal with the WISP at any time during the contract period. By agreeing to longer

contracts and put in additional safeguards such as exit barriers for both parties etc, a much more effective relationship can be built with less costs for monitoring, preventing opportunistic behavior.

7.4.3 Further conclusions

Benefit of exclusive rights

In the very beginning of public WLAN history, a few years ago, WISPs where competing fiercely in a land grab of the most attractive venues. One of the most extreme cases is the San Francisco International airport, where Aerzone (who later folded) agreed to pay 2 million dollars for the exclusive rights over a three-year period.

However, with roaming inching ever closer, most WISPs believe it to be a reality in 2002, the benefit of being the only WISP in a venue can be questioned. The “exclusive” venue is not a competitive advantage when everyone can access it. Although it is thinkable in theory that a WISP could demand a premium roaming charge for especially attractive venues, there lots of issues of both technical and business character to solve before that is reality.

Comparison with other external actors in the airports

It was found in the empiric studies that shops, restaurants and other external actors generally pay revenue-based fees for their right to provide their services in the airport, sometimes in combination with a fixed fee. Due to high cell phone penetration, pay phones are virtually non-existent in Scandinavian airports, but although the revenue is quickly diminishing, they still represent significant income for their US counterparts. Pay-phone contracts are sometimes passenger-based and sometimes based on actual usage revenue. In the latter case airports have seen a decline of 50-80% the last few years.

Cellular carriers are the exception and usually paid fixed fees, except for in the Miami airport. In some airports the carriers are not even present, but have chosen to "beam in" from towers outside of the airport, a measure not possible in the airports with larger ownership of the surrounding areas. The fact that revenue based fees are not charged to the cellular carriers does not make it safe to say that the same model should be used with WISPs. The two industries, while at first glance similar, are in fact very different. The airports are an important area for cellular carriers to be present, but not nearly as important as for WISPs. It is only one of hundreds of thousands of base stations for the cellular carrier, but a vital point of access for WLAN.

There is no reason why the venues relation to WISPs could not be the same as to other external actors, where a revenue-based business model is used. Since the venue itself can be part of the sign up of 24-hour subscriptions, it seems natural to give them an incentive to market the service.

Issues to be resolved

When asked what is needed for a higher degree of demand for public WLAN services, the majority of venues mentioned roaming. They seem concerned with the fact that they have to promote a certain WISP to the passengers before another (which is ironic since few seems interested in a airport branded portal, making the service more neutral). The consensus was that, without roaming, few customers would bother to get a monthly flat rate contract, since they could not be sure it would work at their particular destination. The shorter 24 hour cards where deemed to be too expensive.

Other responses included the need for smaller devices, implying that PDAs and Mobile phones need to be able to handle WLAN cards. These products have higher penetration rates, and are much easier to pick up on the go, as is the situation on an airport. A few mentioned increased security measures in the corporate internal networks, by adoption of VPN solutions.

Applicability to other venues

The findings in this research are not directly applicable to other venues than airports such as hotels and cafés. The airports are simply so much more attractive to WISPs, and can put much more pressure on the WISPs in a negotiation. However the basic principles are the same in all venues.

7.5 Suggestions for future research

A question that has been found to be unanswered during the course of the thesis is that of what actor should handle the relationship with the end user of WLAN services. Currently the WISPs and Roaming brokers handle the job, a situation which not only may lead to confusion as to who is responsible, but is highly questionable in a efficiency perspective.

As virtual WISPs emerge, venues become WISPs and cellular carriers enter the industry, a multitude of actors aim for the customer relationship. All of the previously mentioned can be argued to be the most suitable for the job, but research is needed to determine who would be the optimal actor for the job.

Another issue is the ownership of the infrastructure in the long run. As of today the WISPs own it, but in many cases the venues are taking more of the responsibility in that arena. Concerns might be raised that economies of scale are lost when the jungle of owners are to maintain and update their diverse range of infrastructure. Compared to the regular communications world, where large carriers in some cases pool their resources to get the scale necessary, the WLAN world may seem highly inefficient. Perhaps specialized infrastructure management companies will emerge?

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Appendix:

Interview template Airports

Overview question:

What are the differences / similarities in the business models when it comes to your interaction with the operator of WLAN services and other external actors?

WLAN solution today
How does your current WLAN solution look like (on both departure halls and lounges)? (WISP/WISPs involved, Contract time, Is exclusivity right included?)

- Who owns the WLAN infrastructure (today and after the contract has expired)?
- Do the WISP/WISPs pay any fee for their presence in the airport and if so, how was this fee decided (auction etc)?
- Do the airport share any of the cost for infrastructure?
- Do the airport share in any of the revenue generated from the services?
- Why was current solution chosen?
- What alternatives where looked at (why not chosen)?
- Who decides over what in the airport (lounges, departure halls etc)?

Future

- Would your airport consider running WLAN services itself (with the aid of an enabler) and in effect become a WISP?
- What are your feelings towards a complete outsourcing solution like the one NYC port authority have agreed with Concourse communications?
- Are you looking for a common solution with other airports?

In your view, what obstacles needs to be resolved for WLAN to take of and become profitable at a venue such as an airport regarding:
Technical issues, Legal issues, Business issues

Interview template WISPs

What is your current strategy (geographically, types of venues, target customers)? How many hotspots do you have today? How many are planned within a year?

Current strategy

What does your current pricing model to the consumers (per minute, day, month etc) look like? Why was that model chosen?

What different business models are you currently using at venues, regarding:

- Sharing of revenue
- Sharing of implementation costs and ownership of infrastructure
- Do they differ from your main competitors and if so how?

Do you strive to be the only WISP in each venue?

Is there a "land grab race" going on between WISPs for signing attractive venues?

What is generally the time range for your contracts with venues?

Are payments to and/or revenue sharing with venue owners a large part of your expenses?

Are the venues generally aware of their market value as owners of wireless space?

Do the venues generally prefer a single or multiple operators
Do they prefer profits to a reliable service provider?

How far in progress is bilateral roaming between WISPs?

What are your largest competitive advantages?

Who are your biggest competitors? Today and in three years time?'

Future

Is the possibility of venues becoming WISPs of their own a major threat in the future? (Such as the Copenhagen airport)

What are the major obstacles that need to be resolved for public WLAN to take off, regarding technical issues?, Commercial issues?, Legal issues?