Serving the teleworker: creating added value with wireless technology in the travel industry

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Abstract

Information technology plays a critical role in the travel industry. Even traditional reservation systems have had a key role in travel services. Today reservation systems are commodities, and due to increasing competition, new services are needed. Leveraging customer services through modern communication technologies, especially through wireless communication technologies, seems to have great growth potential. Efficient and reliable wireless services are a key success factor for the mobile teleworker.

In this paper we discuss the importance of making wireless services available that will allow travellers to access information through wireless terminal devices. The research question discusses whether wireless technology can be used in order to create added value for customers.

In our article, we discuss the market situation and operating practices of the travel industry. Then we turn our attention to wireless technologies, their potential and the challenges of implementing them. Our empirical data is obtained from four Finnish market leaders in the travel industry. In particular, their current status and how they plan to use wireless technologies are discussed.

Our findings suggest that wireless technologies will become an integral part of the travel experience, firstly for business travellers but, even then, only in the long run. This is because four major obstacles to the fast development of wireless technologies can be seen: Limited customer demand, technical difficulties, the lack of defined industry wide standards and unclear business models and service delivery difficulties.

1. Introduction

Hardly anywhere do two principal growth trends meet so clearly as in the area of using modern communication technologies in tourism. Mass transport the world over is under pressure to compete with private cars which, when distance allows, offer superior flexibility and transportation capacity compared to public transport. Among other things, this demands new ways of easing the planning of door-to-door journeys, eliminating waiting during transit, easing the transportation of accompanying goods or baggage and making payment smoother. Information technology has now matured enough to offer exciting benefits to passengers throughout their journey. For airlines, this will also reduce the 20 to 25 per cent overhead on the cost of ticket distribution. The net impact on financial results will be significant (Rae, 1998).

Our research focuses on the application of wireless communication technologies in the tourism industry, especially for the needs of the customer, i.e. the travellers. Wireless technology implies mobility, which is a key concept for tourism. The key mass customer wireless technologies are mobile phone technologies and wireless local area network (WLAN) technologies. Apart from those, there are also several other technologies, such as Bluetooth or WiMAX, or the basic technologies of radio and TV-broadcasting, which are currently undergoing the process of moving from analogue to digital broadcasting. In this paper, the focus is on WLAN technologies. WLAN is a new generation of LAN's, and can be seen as a technological advance upon traditional hard-wired local area networking technology (Kumar, 2004).

It is likely that wireless communication technologies will over time replace wired technologies in many areas (Hamilton & Rupp, 2007). In this process, adoption speed is an issue of innovation diffusion dynamics. As (Hovav et al., 2004) define it, the adoption of an innovation can happen through gradual replacement and involve the contemporaneous use of old and new solutions, or the change-over to a new innovation can happen relatively fast and make the old obsolete almost instantly. The Hovav & al Internet Standards Adoption (ISA) model is presented in Figure 1. According to the model, the adoption speed and type depend on how good the innovation is (Usefulness of features) and how much the market environment values and wants the innovation to proceed (Environmental conductiveness). We will come back to this framework when assessing the results of our empirical study.

Another important issue in customer service intensive fields such as tourism is the domain of new technology use. Specifically; is the technology used by the service providing company itself and if so is it used in the back-office or the front-office service or in both? Or is the service offered primarily to customers?
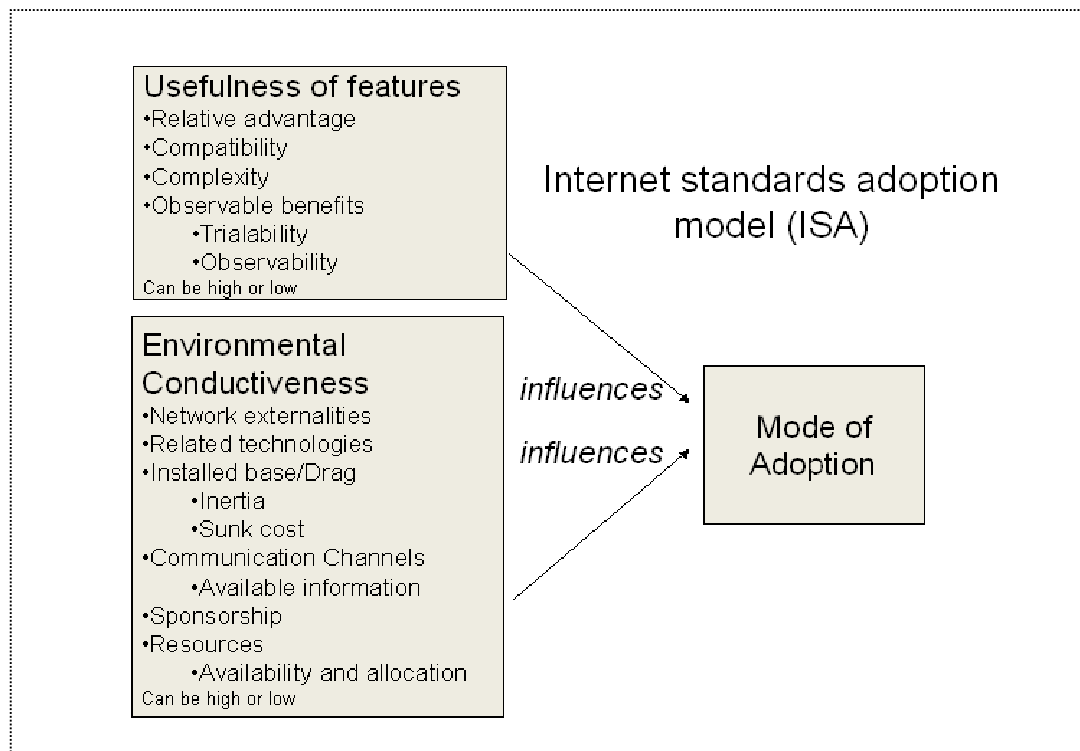
Figure 1: Internet standards adoption model (ISA) (adapted from (Hovav et al., 2004))

We structure our discussion around the benefits of wireless technologies in the tourism industry. Here we look at wireless local area networks - WLAN-technology. Consequently, our research questions are

- What is the added value of wireless technologies for the tourism industry?
- How is the adoption process of wireless technologies proceeding in the tourism industry?
- In what ways could travellers benefit from wireless technologies?

Our study is based on a literature study and on four case studies. For the case studies, we conducted one to two interviews at each case organization. These interviews were carried out from August to December 2003. In addition, teleoperators were interviewed in 2008 in order to get a wider perspective on developments within mobile wireless networks.

2. Tourism as an industry

The tourism industry is a fascinating industry and growing fast. According to the world tourism barometer international tourist arrivals reached an all-time record of 760 million in 2004, which is an increase of 10% on 2003 (WTO, 2005). The Economist reports the following estimates of growth figures for air traffic (2004):

- By 2017, the annual increase in air travel will be greater than total air travel was in 1970.
- Air traffic will triple in the next 20 years.
- International air travel is growing at 8% a year.

Few other industries will grow as fast. It should be noted here that we refer to the transfer of people, and not goods, between distant physical locations, though these two transfer objects are usually catered for by the same transportation means. For the traveller, tourism always includes the element of experience, so it is not a daily routine. Thus, daily work travel routines do not fit into the definition. However, our concept of tourism also includes travelling that is done for the sake of work. However, to be defined as tourism this work-related travelling should not be a daily routine.

It is evident that both tourism and information and communication technologies (ICT) are major growth areas among major industries. Due to the vague area of the industries, exact growth figures are hard to extract. According to the European Information Technology Observatory (EITO, 2004), the total ICT market in 2004 grew by 3,0% in Western Europe, by 3,7% in the U.S.A. and by 2,2% in Japan and by 8,5% in the rest of the world For telecommunications carrier services the figures are even higher: Western Europe 3,8%, USA 6,7%, Japan 3,8% and the rest of the world 11%. As new technologies enter the market, and old technologies give way to them, it is clear that some technologies, especially in telecommunications, enjoy much higher growth rates. The Internet and mobile communication technologies belong in that group.

As described above, it is clear that the world's travel industry is huge, growing, and rapidly changing. Currently estimated at $3.1 trillion, it is forecast to grow to a $7.1 trillion industry by the year 2007. This huge growth is being driven by the shifting expectations of the traveller and by proactive industry initiatives. Increasingly they are both being shaped by innovations in technology. According to (Rae, 1998) change is occurring in four key areas:
- Individual consumer power.
- People can afford to travel more than before.
- Operational optimization processes.
- Service providers constantly develop their processes and make them more effective and thus more affordable.
- End to end journey management.
- Customers are offered complete travelling solutions including all the services they need during travelling.
- Improvements in the travel experience.
- Travelling is easier than before.

The world economy has altered since the economic depression of the early 1990s. Before that there was a significant boom in tourism, in both the leisure and working segments (as in the world economy generally). People had money to travel for vacations and successful trade required businesses to travel both overseas and domestically. By the end of the last decade, the situation had changed significantly. The reduction of passenger miles was not epochal, but similar to the sequences of the oil crisis in the 1970s, and the structure of travelling and its arrangements reached a turning point. The trend resulted in less departures and bigger transport units.

The support that telecommunication and tourism give to each other can be seen as a series of effects. The first effect is what we call a *"market effect"*. Time and money saved through the use of telecommunication can be used for tourism, especially the leisure part of the industry. Linked to this effect we can also see a *"competitive*

effect". In this effect electronic means of communication compete with actual physical travelling. Third, we can analyze some forms of telecommunication and say that e.g. surfing on the Internet addresses the same need for new experiences as tourism does. This we call the *"experience effect"*.

The reasons for taking tourism as a case industry in this article and not another industry are that its growth track and the potential of the industry provide excellent material. Furthermore, we feel that the industry has not been studied enough, even though there are significant contributions that have been made in specific areas e.g. airline reservation systems (Copeland & McKenney, 1988; Hopper, 1990). Another important issue is that the service sold consists of a great deal information, though physical goods and especially physical transfer services are also of key importance. In essence we are studying a complicated logistics area, in which effective information flows that support physical flows are of key importance.

Tourism services are nearly always produced by a complicated value system. Since tourism is very much about experiences and feelings, even small disturbances in the value system can cause huge disappointments for a customer (e.g. you are not given the seat in an airplane you have reserved). Hence, the perfect functioning of the value system is of key importance, and here the electronic integration effect comes into play. One illustration of this integration and convergence of different technologies, processes and outcomes can be seen in "ticketless travel", in which using travel bureaus for travel planning, reservations and issuing tickets has been replaced by traveller's booking online. Travel information has therefore become digital and can be verified at any check-in location and means traditional hard-copy tickets are no longer needed. In many cases it would be very hard to manage without information technology. Consequently, travel reservations systems are critical to flight and cruise reservations.

Today the emphasis is on accessing information anytime and anywhere, even with mobile terminal devices. Customers want to have access to travel-related information, but this is not enough. The traveller may also want to access systems that they normally use e.g. the files in their office. With the current technology and mobile terminal devices this is possible. In the best possible case a customer would not have to connect any wires to be online. Here the role of wireless technology is important. Universal wireless connectivity would mean that information and files could be accessed from anywhere. (Hamilton & Rupp, 2007)

3. Information technology and mobility

3.1 The concept of mobility

Today people travel more than ever, for both business and leisure purposes. In particular, business travellers need to stay connected to their customers and colleagues even while travelling. An increasing number of employees are mobile and take work into public places like hotel lobbies, airport lounges, parks and different vehicles. For these workers the traditional office environment is merely a place where files and data are stored, and where staff or team meetings are held (Hamilton & Rupp, 2007). The actual work is done on the road. As a result, it is natural to expect solutions that make

it possible to access information anywhere and anytime. Usually these are based on wireless technologies and rely on portable terminal devices. In this context mobility is a key issue.

In this paper the term mobility refers to a user carrying a portable terminal device that connects to the network via a wireless connection. Wireless connection includes a wide range of technologies from voice oriented networks to data-oriented networks. Cellular mobile systems such as a GSM-network are examples of voice oriented networks, whereas wireless local area networks (WLAN) are more data-oriented. Advances in cellular technology have blurred that distinction and third generation cellular networks (3G) and cellular phones / PDA's (Personal Digital Assistant) can offer broadband wireless connectivity if the user is located in an area where there are 3G access points. These technologies are still based on the GSM-network, which means that the basic network infrastructure is owned and maintained by teleoperators and the customer needs to pay in order to use the system. In contrast, a company can easily setup a WLAN-network of its own users and offer connectivity to customers visiting the office. The basic idea of who owns the infrastructure and what are the terms of use are different in 3G and WLAN. In addition, WLAN offers significantly higher bandwidth and speed than 3G. In this paper we are especially interested in the data-oriented networks that are designed to connect the mobile user to email, databases and other resources and systems within the wired infrastructure. Nevertheless, wireless access requires the seamless integration of wired and wireless technologies in order to provide mobile access to the mobile user.

One of the key features of WLAN networks is that they are tightly integrated into an existing infrastructure. In addition, implementations are highly flexible as new users and locations have to be networked instantly when access points are relocated. This makes wireless networks scaleable and adaptable to changing networking needs. Most wireless local area networks use the IEEE 802.11x specification, which is the industry standard for wireless networking communications as established by the Institute of Electronic and Electrical Engineers. The bandwidth of this technology is typically 11 Mbps (802.11b) or 54 Mbps (802.11g). These types of wireless networks are backwards compatible, and so higher bandwidth devices can also operate using a lower speed. Furthermore, different manufacturers have been able to develop compatible WLAN products as a result of setting industry wide standards. The results are visible in the fast growth of the 802.11x-based wireless LAN installations.

Mobility can be further divided into three main classes (Pandya, 1995) :
- Terminal mobility.
- Personal mobility.
- Service portability.

Terminal mobility includes devices and technologies which are needed for mobile access. A user's terminal must be equipped with a wireless network interface. In addition, wireless access points are required in order to integrate wireless users into the rest of an organization's information technology infrastructure. Connectivity requires that a user's terminal is inside the wireless zone, within the range of the wireless access points. It is also necessary that the communications settings of the terminal are set so that they allow connection to the network used, if a user moves from one place to another settings may need to be changed. It is typical of terminal

mobility that the network or service that will be accessed must be able to identify the terminal device otherwise a connection will not be established. This is a problematic issue for wireless networking because wireless technology was not designed for dynamically changing environments. The result is that settings must in some cases be set manually as the terminal may not automatically change the communications settings.

Personal mobility refers to the human need to be connected while travelling. As Breure & van Meel (2003) point out it is increasingly important to stay in touch with colleagues and access work databases from e.g. an airport terminal. Connectivity should also operate in both directions as not only should the mobile user be able to connect to colleagues, they should also be able to contact their travelling colleagues wherever they might be.

Service portability relates to the services that the user is using with a mobile terminal. This is where the added value of wireless technology is (Kumar, 2004). Ideally, users should be able to access files, databases and applications through different terminal devices. This is quite challenging for service developers for several reasons. Firstly, terminals range from advanced cellular phones to PDA's and to laptop computers and the terminals run on different operating systems. Secondly, as a result of different terminal devices connection bandwidth can vary substantially. Thirdly, the task of the content providers and service developers is further complicated by changing environmental conditions. For example, the user may move to a location where there is lots of interference, resulting in the connection terminating. In this case the terminal should be able to reconnect and log on to the service as automatically as possible.

Mobility is not only about portable terminal devices and wireless technology. Typically, both wireless and wired technologies are needed when providing a connection for the mobile user. The link between a user's terminal and the closest wireless access point transmits the signal wirelessly. However, the rest of the connection can use infrastructure that is based on cables. These technologies and related applications need to be thoroughly integrated so that the user can access information across different platforms (Byrd & Turner, 2000). Furthermore, it is up to the user to decide which terminal and technology to use in a given location. For example, a user may choose to log in using a wired connection, e.g. by plugging their laptop to a RJ45 jacket in the wall, because it often delivers more bandwidth and is more reliable than a wireless connection, especially if a signal is weak.

To summarize, both wireless and wired technologies are needed to provide mobility to a mobile user. Typically, wired technologies are used as backbone connections for an infrastructure but mobile users connect their portable terminals to the network using wireless technologies. However, in some cases a user may choose to use a wired connection if the reliability of the wireless connection is not very good. The need for wireless access points is increasing as more and more people work outside the traditional office environment, and the need to connect to work information with a portable terminal device grows.

3.2 Towards a wireless future

Information systems rely on infrastructure that connects workstations, servers and systems together. Traditionally, cable has been the media that is used in connecting separate computers and systems. Wireless networking technology has started to change this and is now a good alternative for connecting users (Forman & Zahorjan, 1994). Wireless technology allows a user to be "always connected", which makes it possible to blend work and home tasks flexibly (Hamilton & Rupp, 2007). In many industries, e.g. consulting, the need to combine travel and work is further accelerating the move towards wireless technologies (Cascio, 2000).

The key issue in wireless technology is user mobility. However, wireless technology is also being marketed for connecting separate local area networks. For example, two buildings with hard-wired local area networks can be connected with wireless links. When the first wireless devices were introduced in the mid 1990's it was believed that savings from the installation and relocation costs of a wired infrastructure would justify the additional cost of wireless technology.

Typically, a user's terminal uses wireless technology to access a network while the rest of the infrastructure is based on a hard-wired network (Johnson, 1996; Yen & Chou, 2000). Wireless technology relies on hard-wired cables in the backbone network, while the connection between a user's terminal device and the wireless network access point is wireless. This architectural approach is called "hierarchical wiring". For example, permanent cabling is used when connecting wiring closets, hubs and switches together. These are not moved from one location to another and so there is no need for mobility for the backbone connections.

Wireless technology has not yet replaced fixed networks for most uses in organizations. In a typical case wireless technologies complement and integrate into an existing infrastructure rather than replace hard-wired connections. This is interesting because there are plenty of hardware and software providers that develop systems using wireless technologies. Furthermore, wireless technology has been available as an end-product for years. What is then the explanation behind the rather modest use of wireless networks? The explanation lies in the challenges of wireless technology.

3.2.1 Challenges of wireless technology
There are several problems and challenges in wireless connectivity and mobility (Forman & Zahorjan, 1994). The work environment presents noise, echoes and blocking signals, and they change more dynamically than those of wired connections. As bandwidth depends on signal quality connections will thus often suffer from poor performance. When a user moves close to the far reaches of a network the signal becomes weaker and this affects the performance of the connection.

Overall, mobility is based on battery-operated mobile terminal devices like laptop computers and PDA's. What is also required is a network of wireless access points. Due to the fact that the reach of a wireless access point is relatively short there must be plenty of access points to provide a signal. The coverage for in-house systems is approximately 40 metres from the access point whereas outdoor systems cover a wider area of typically 2 kilometres. However, current technology does not allow for

as wide coverage as cellular phone systems. The outcome of this short coverage means that a mobile user can connect only in an area where there is a wireless network, in places like hotels, conference centres and other special sites.

Moving from one place to another can be problematic within a wireless infrastructure. Ideally, a terminal device should be able to switch from one network access point to another, from one wireless zone into another. This is not always automatic in a heterogeneous environment and connections may require resetting, if the access points are so different that bandwidth and other transmission or connection related parameters need to be adjusted. If a user's terminal and a wireless access point can adjust these parameters automatically there are no problems. However, in the worst case the result is a lost connection or the need to make changes manually and reboot the terminal. This can happen when a user moves from one organization to another as there is no guarantee that a terminal will connect automatically without manual adjustments or other procedures. The root of this problem lies in the fact that mobile networking was not originally designed for a dynamic, changing environment (Forman & Zahorjan, 1994).

There are also other concerns with wireless technology. Batteries and power consumption have been one of the key areas of development in mobile technology. Advancements in cellular technology, battery saving techniques and longer lasting batteries have had a major impact on wireless networking technology. Another important issue in the wireless environment is security and privacy. In a recent Information Security magazine survey, 74 percent of the information technology, networking, and information security practitioners polled were "very concerned" about the security of corporate wireless networks. Wireless LAN carries signals in the air and these may be eavesdropped on by anyone within range. Today most wireless networks use an encryption scheme and more secure algorithms are being developed. However, the poor security of the first wireless systems still affects decisions about whether to move to wireless local area networks.

3.2.2 Benefits of wireless technology
Wireless technology has significant potential, despite its shortcomings. This is because wireless offers benefits that are not possible to achieve with a traditional, hard-wired infrastructure. Wireless connections eliminate time-and-place restrictions that are typical of hard-wired networks and desktop computers (Forman & Zahorjan, 1994; Breure & van Meel, 2003). With a portable terminal a user can move from one location to another, and still connect to information, people and data in their company's information system . For example, a user can sit in a hotel lobby and check sales figures online from the hotel's server with his or her wireless computer.

Wireless technologies have changed the modern life-style and new concepts like "ad hoc -networking", "nomadic access" and "mobile computing" have emerged. Ad hoc -networking refers to a situation where a group of mobile users connect together and share ideas, files etc. For example, a company's consultants, using their laptop computers, may share memos or other data in a hotel lobby through a wireless local area network. Nomadic access can also take place from another geographical location, for example from a customer's premises. Both ad hoc-networking and nomadic access are included in the broader concept of mobile computing. Mobile computing refers to the ability to connect to information with wireless, portable terminal devices and not

only from a desktop computer. Mobile computing is possible only in areas where there are wireless access points. It is argued that these areas are the new offices where users of mobile devices will work. Alternatively, mobile access can be provided by other technologies than hot spot based wireless technology. Cellular mobile technology and networks are one possible solution that can provide ubiquitous wireless access.

4. Four case studies in the Finnish travel industry

We examined wireless technologies in four selected case organizations. They are among the leading organizations in the Finnish travel industry. Restel is a hotel and restaurant company, Silja Line runs ferries and cruises across the Baltic seas, Finnair is Finland's national airline company and the Civil Aviation Administration in Finland (CAA) operates airports in Finland. The use and role of wireless technologies in the case organizations are described below.

4.1 Restel

The company
With a turnover of €205.7 million in 2003, Finland's largest hotel and restaurant company Restel Ltd employs approximately 3,000 professionals in close to 280 establishments around Finland.

Its main business activity is concentrated in three hotel chains, Cumulus, Rantasipi and Ramada totalling 39 hotels. Restel also operates the Holiday Inn Garden Court Hotel at Helsinki Vantaa Airport and the Holiday Inn Helsinki City Centre.

Services for customers
All Restel hotels are equipped with WLAN-services for customer use. The services are provided by TeliaSonera under the brand "Homerun". Typically, in their hotels some floor levels are equipped with this service, as well as the most important restaurants and lobby premises. In particular, a connection is needed in the breakfast restaurant. The coverage of a base station is about 40 metres.

TeliaSonera has built the networks, and is responsible for the operation. The hotel's role is to hire out the needed cards to the customers. The current charge is 16 Euros for 24 hours. Restel gets a 10% commission of these sales, and the income generated is very marginal to its total business. TeliaSonera is also responsible for the customer support of the WLAN usage through a toll-free call number.

Restel is not aware of the traffic running through the WLAN-networks, as the networks also operate with cards based on long-term agreements with TeliaSonera. The biggest user group so far is that of TeliaSonera's staff itself, as they use the Restel hotels on their business trips.

At the moment Restel has no further plans when it comes to WLAN. Most likely restaurants operated by the company are not going to offer WLAN services. Full coverage of WLAN will anyhow be built into all new hotels that the company is going to run.

Customers demanding WLAN-connections during room reservation time are rare, maybe only one in 10,000. However, and especially after its pioneering service was installed, Restel has received some long-term customers because of the WLAN-networks, which has been a factor for the many foreign companies and foreigners that have set up long-term offices with Restel hotels.

Internal usage
All Restel's own systems use traditional wired technologies, Restel's own networks and the WLAN-networks intended for customer use are fully separated.

4.2 Silja Line

The company
Silja Line Ltd is the leading passenger ferry company in the Northern Baltic Sea. It operates seven passenger ships on routes between Finland, Sweden, Estonia and Russia. The company's roots date back to 1884. The majority of its operation is based on ships simultaneously combining ro-ro services and high quality cruise services to passengers. In 2003 the company carried some 5 million passengers and had a turnover of €517 million.

Services for customers
Silja operates WLAN-services in parts of its four big ships. These services are targeted at customers.

The ships have satellite connections, which are used to coping with many different kinds of data transfer. In its land operations, WLAN-technologies have not been seen as necessary as the company has fully functional, traditional wired LAN's in operation. Some employees also have mobile computers equipped with WLAN-cards for use in public WLAN-networks.

With regard to customers, WLAN-connections are offered on the ships' public premises in the following order of importance:
1. conference facilities
2. commodore class lounges
3. public restaurants

WLAN-connections are not offered throughout the ships nor in the cabins, none of which have fixed LAN-connections. On the ships, more WLAN-base-stations are needed than in concrete buldings as metal walls effectively attenuate signals.

Silja operates many of its own terminals and WLAN-services are not available there. This is a conscious decision because it is believed that people spend only short periods of time at the terminals.

The WLAN-infrastructure on the ships is operated, maintained and owned by Telia-Sonera, which runs the Homerun-service. Anyone with a subscription to this service can also use the network on the ships. Silja rents pre-configured PC's on the ships for those willing to use the services and grants a 24 hour usage time to TeliaSonera's network. Pre-configured PC's are a perquisite since it is not possible to organize any

kind of help desk on the ships. The PC's are equipped with a "go back" –function, meaning that they are always totally erased of new material and returned to their original state as soon as they are restarted.

For Silja, the expensive part is the satellite connection that the ship's WLAN uses for Internet connections and Silja pays for this connection for all its WLAN-users. The capacity is limited to 1 Mbps, which is the limit set by the satellite end and which is the capacity that has to be shared between all the seven ships. For an active netsurfer, the physical limits of this connection fast become real.

Internal usage
In its own operations, Silja does not use WLAN-technologies. However, there are two future applications of WLAN-technology that are about to enter a test-phase. Firstly, when the ships enter the harbour area, high-capacity data transfer could start already before the ships dock. Technology could allow speeds of 2 Mbps even at distances of up to 2 kilometres. This would have a significant impact on the actual amount of data that can be transferred during a harbour visit, usually just one to two hours. Secondly, there is a need to establish temporary sales points with normal connections to the main point-of-sale system on the ships. This could be achieved with WLAN-technologies.

4.3 Finnair

The company
Finnair was established in 1923, which makes it one of the world's oldest operating airlines. Finnair flies to 16 destinations within Finland. The domestic flight network is one of the densest in the world in relation to population. Finnair's international route network covers about 50 destinations and the number of foreign destinations is further increased by leisure flights. Today the number of personnel in the Finnair Group is approximately 10,000.

Finnair's information systems department is located at Helsinki-Vantaa airport in the company's headquarters. Helsinki-Vantaa is also the central point for national and international flights within and to and from Finland. Consequently, most important information systems and infrastructure definitions are developed there.

Services for customers
Wireless technology is also used in the airplanes. In the cockpit wireless computers can access land-based networks while the plane is at the airport. There have been plans to extend wireless WLAN to the airplane so that flying customers can connect to the Internet during the flight. These plans have not been realized mainly because of technical problems during flights, e.g. connections are made through satellites and they cannot provide a reliable connection throughout the flight.

Wireless networking is used in offices to connect mobile computers, though wireless access in offices is not in widespread use by Finnair. However, in places where cabling is problematic wireless technology has been used. Until now office computing has been based on hard-wired networks, but the newest policy is to provide users with computers with WLAN-capabilities. It is therefore likely that in the future office computing will also take place wirelessly. Finnair does not provide wireless access for

customers on its terminal premises because this is seen as a task for the terminal infrastructure operators.

What is the role of wireless technology in Finnair? Currently, it is considered an interesting technology that has potential. Even though wireless technology is not expensive, installing wireless systems so that they are robust and secure is. Today wireless networking brings added value in that it connects hand-held scanners to the main information system. Without wireless scanners airplane loading and boarding would take considerably more time. A wireless network provides airplane servicing units with access to operative information. The office use of wireless technology is still modest but will become more widespread as new computers provide wireless connections.

Internal usage
Finnair's wireless network infrastructure covers the airport area at Helsinki-Vantaa. Finnair's wireless network is used for several purposes. It connects service units that operate at the airport field and provides vital information such as, which planes are landing, how much kerosene is needed and how many passengers will be boarding. A wireless network is particularly useful for connecting handheld scanners to the airport's infrastructure. These devices play an important role in the checking of luggage.

4.4 The Civil Aviation Authority (CAA)

The organisation
The Civil Aviation Administration in Finland (CAA) maintains Finland's network of airports and the air navigation system. The goal of the CAA is to provide and develop safe, competitive airport and air navigation services. The organization serves both air passengers and organizations operating at airports. For example, these organizations include airline carriers and flight service companies. At the moment the CAA's airport network consists of 25 airports and the organization employs almost 2,000 people.

The information systems department of CAA consists of 23 IT experts. It is located at headquarters in Helsinki-Vantaa airport. Each airport has a local contact person who works together with the IT department to maintain and develop the local airport infrastructure. Most servers and systems are located at the headquarters, even though some systems are managed by outsourcing partners. One important and visible service is the system that provides up-to-date information on incoming and outgoing flights at all airports. This service is accessible via public text-television or the Internet.

Services for customers
What is the status of wireless technology in the CAA? Wireless access is possible at selected airports for travellers. The service is provided and managed by TeliaSonera (Sonera HomeRun). The Sonera HomeRun service is used with a portable terminal device, a Wireless LAN card and an Internet browser. A separate information-security solution VPN (Virtual Private Network) also enables access to the company's own intranet, which makes the service available to its employees and allows them to attend to their business matters wherever they happen to be. Today Sonera HomeRun users can connect wirelessly at nearly 700 locations in the Nordic countries and elsewhere

in the world. In the future new wireless service areas will be made available to customers in many new locations.

Wireless access has been available for about three years now at Finnish airports. When the decision to build wireless services was made it was believed that the technology would develop rapidly and therefore it would be better to outsource it.

In the future wireless systems will connect different service companies at the airport area so that they have more accurate information on what is going on. Furthermore, there has been discussion on how new domestic airline carriers could better use the CAA's existing IT infrastructure between its airports. In addition, different mobile airport services for travellers are under consideration. The goal is to develop an infrastructure at airports that better meets the needs of other organizations that operate at its airports, as well as serving the passengers.

Internal usage
Wireless WLAN is used in some locations for the CAA's own internal use but most users are still connected by a hard-wired connection to their information systems.

5. Follow-up 2008

From May to June 2008 we conducted a follow-up study on how WLAN-usage in the tourism industry has developed. This time we approached the Association for the Finnish hospitality industry, and the leading Finnish teleoperators, TeliaSonera, DNA Finland and Elisa. In this second round of research we adopted an industry level point of analysis in order to support our case study work. Five interviews were conducted.

Hotel Industry
In 2008, the wireless network was still not yet a commodity in hotels. The three big Finnish hotel chains (Restel, Sokos Hotels, Scandic hotels) all have WLAN installed in almost all their rooms and hotels. The same is true for most of the smaller hotel owners, but not to the same extent.

The service is, however, not offered for free. The trend seems to be that frequent customers who hold a bonus card for the hotel chain receive free or very low-cost WLAN-connections, whereas occasional customers still have to pay for the services.

The operating of the networks is left to teleoperators in the case of all the big hotel chains as they have the resources for help desk activities. The trend towards operator-operated services will become even stronger as the coming European-wide legislation will, in the future, demand that all customers connected to such networks be identifiable upon request. Only operators will have access to the registers and the needed know-how through which they can connect the IP and Mac-addresses of physical devices and identify the machine connected to the network. The goal of actually identifying who is using the machine, a goal for the legislation, will most probably never be attained through current technologies.

Ferry companies

The problem of having to use satellite connections on ferries still persists. The much talked about technology of WiMAX is still lacks the standardization that would bring fast connections to moving vehicles such as ships.

The high cost of using a satellite connection means that the wide scale use of WLAN on ships will not happen in the near future. As in hotels, WLAN connections are offered to frequent travellers who have the required bonus cards and they receive the service at lower prices or totally free. Due to technical restrictions (the thick metal bulk of the ship) this service is usually available only for the most expensive cabins. On some routes, users can buy WLAN-connection time in the cafeteria and restaurant areas.

The Aviation Industry

The situation with WLAN connections in the aviation industry has remained relatively stable. During a flight, the Finnish airline Finnair does not yet offer WLAN connections. This is because installing the technology on old planes is too expensive, so only new machines will have the required infrastructure. Making the whole fleet WLAN-ready might take up to 25 years.

After having the planes equipped with the necessary infrastructure, the same problems as on ships persist. Relying on satellite connections is expensive, but GSM-network based solutions might be a solution in the future. This development has two limits: over oceans and even small seas a GSM-network is not available. Secondly, roaming arrangements are extremely difficult to organise and teleoperators still have to work hard to be able to offer suitable service platforms for airplanes.

At airports the premise owners, such as CAA in Finland, continue to offer commercial services. A free-access WLAN at an airport is already a next to impossible idea together as in an airport area there are typically hundreds of enterprises and organizations operating and the idea that the owner of the premises would offer free WLAN-services to all of them is impossible. With the same logic free services for travellers also becomes impossible.

Towards 3G

Today mobile users increasingly use 3G technologies to connect to the Internet. This technology is potentially better when compared to WLAN-technologies: Firstly, it is easy to use. Typically, the user connects via a 3G phone or plugs a dongle into a laptop in order to get access to the Internet. Secondly, 3G is becoming faster. At the moment the bandwidth for mobile broadband ranges from 384 kbps to 1 Mbps but this will change in the near future. During 2008 some Finnish teleoperators will start providing 5 Mbps and later 10 Mbps connections that run on 3G technology. This offers an alternative to WLAN-technology.

The most important success factor in 3G based internet connections seems to be pricing. Last year Finnish teleoperators started offering flat rate based mobile broadband connections. Earlier 3G pricing was connected to the amount of data transferred. The result has been a huge boom in sales of mobile broadband connections. Additionally, changes in pricing have made 3G based internet connections affordable and very popular. The coverage of 3G is good. In fact, 80% of

the population already has 3G access in Finland. At the same time the bandwidth of the 3G network is being developed so that higher speeds can be used in the future.

The advantages of mobile access to the internet are clear and so the penetration of mobile broadband is rapid. In fact, the situation is very similar to the adoption of mobile phones in the 1990's.

"Mobile broadband means that access to the Internet becomes personal" Panu Lehti, Elisa Oyj
Some users have switched from hard-wired broadband connections in their home to mobile broadband but there is still room for both technologies and many have both types of connections. Hard-wired connections offer higher speed and are suited for bandwidth intensive applications like video, whereas mobile broadband is the best option for a mobile user.

In general, 3G-based mobile broadband is attractively priced but only for domestic users. Tourists and business people coming from other countries pay based on data transfer, and this can become very expensive. Teleoperators are working on the issue at EU level but today flat rates are not applicable outside national borders. When a traveller is abroad high fees apply and it may be better to seek the nearest WLAN hot-spot.

6. Discussion and conclusion

Wireless technology is a reality. With wireless mobile devices and technologies it is possible to log in and keep in touch anytime and anywhere. This allows changes in the way people work and communicate. For example, it is possible to share a memo with colleagues in a hotel lobby, which means that a common issue can be worked through without pre-planning. In this way working is no longer tied to a certain location or time (Hamilton & Rupp, 2007).

In this paper, we looked at wireless technologies in the tourism industry and studied the role of mobility and wireless technologies for it. Ideally, a traveller needs to be connected to information when moving from one location to another. Access to timetables, news and email are examples of information that are relevant to any traveller whether for the purpose of travelling for leisure or business.

Interviews with representatives of major hotel, airline and ferry companies revealed that there are two main uses for wireless systems. Firstly, **travel companies use wireless technology internally** to provide access to users of portable terminals. Finnair uses wireless technology when connecting scanners to the rest of the information system so that luggage can be checked. This is a mission-critical operation that has a direct impact on whether airplanes can take-off in time or not. Within Silja Line wireless technology is used to connect ferries approaching harbour to the harbour's infrastructure before docking. These examples indicate that wireless is not only an "added-value service" designed to connect mobile travellers but can also be part of the company's business IT infrastructure.

Secondly, **wireless connections are provided to travellers**. Interestingly, only a small percentage of all travellers ask for wireless connections. The explanation probably lies in the fact that only a small part of all customers are business customers, which narrows down the population of potential users of wireless technology. It seems that when the purpose of travelling is leisure, travellers tend to leave the computer at home. However, they take with them different Smart Phones and PDA's, which need a good network connection.

If we take a look at the three types of mobility as defined earlier, terminal mobility, personal mobility and service portability, we can examine the different services that are delivered by wireless technologies to the tourism industry.

Tourism industry organizations are unsure whether terminal mobility is their business. In some instances they deliver equipment for customer use, such as phones in airplanes or wireless hot spots in hotels. In general, however, customers themselves cater for terminal mobility.

Tourism organizations are at the kernel of personal mobility. The key question for tourism organizations is how much they want to satisfy this need. Interestingly, based on experiences from the case organizations, it seems that the Finnish organizations have left this part to telephone operators.

Service portability was actually not a research question for our study. Finnair has some experience with using WAP-based applications for informing flight passengers but, in general, service portability is not very well developed in the case of these tourism based organizations.

Clearly, wireless technologies in the tourism industry will follow the path of most information technology applications. Certainly, in theory there are great expectations regarding their future, but in practice, the reception of the technologies has been lukewarm and slow. Currently, WLAN and other wireless technologies in the tourism field live alongside older technologies, and the transfer period will be a long one. Wireless technologies are intended to maximize user mobility. Therefore a user's terminal has to use wireless technology to access a network. At the same time, the rest of the network infrastructure may be built with wired technology.

A discussion on how this result was formed is presented in Figure 1.

The relative advantage of wireless technology seems to be marginal in company internal operations. For customers, the mobility dimension is crucial. There are two levels of mobility. Wide area mobility means that connections can be made anywhere where travelling. Local area mobility is common to ships and airplanes. There customers could well be content with wired services.

The compatibility of the new and old systems should be no major problem. However, computers need extra hardware and software to take WLAN connections, and modern handheld mobiles are often difficult, if not impossible, to connect to wired networks.

The observable benefits for the customer are clear in the attainment of mobility. For tourist service providers, the benefits, e.g. in the form of increased customer satisfaction and consequently turnover are not significant.

Network externalities are also evident as are almost all telecommunication networks and applications based on them. The more mobile users that can be integrated into a system the more profitable their running becomes and the more services that can be implemented.

Communication channels refer to the channels through which an innovation can be marketed. Tourist organizations have a wide range of contacts with their customers and the selling of different kinds of added services to them is a standard practice. Hence, selling mobile telecommunication services alongside their traditional services should be no problem.

Sponsorship is very evident in this field. Teleoperators can be seen as "godfathers" that support tourist organizations in wireless technology marketing, as the case studies clearly showed.

The resources for implementing the new wireless systems vary a lot among the tourism organizations studied. However, the big industry players clearly have an advantage but as they have many units to cater for and the unit costs do not receive so may benefits from economies of scale, regarding the number of installations, the differences between the big and the small players are not great.

There is no opposition to the fact that good information services are a part of any travelling experience and that travelling as such is an information intensive activity. The connection between mobility and mobile information needs and tourism is clear.

Nevertheless, we can see that catering for wireless services is not very high on the list of priorities for travel business organizations. We identified four reasons for that:
1. Limited customer demand
2. Technical difficulties, including no set industry wide standards
3. Unclear business models and
4. Service delivery difficulty.

If we take a look at the case studies and their reasons for not rapidly adopting the WLAN technologies we come up with the cross-tabulation as presented in Table 1.

Our case studies clearly showed that only business travellers might be interested in utilizing wireless technologies set at a reasonable price for the service provider. Private travel often happens within a tight budget, and often there is a need to actually forget about the information technology associated with working. Furthermore, even business travellers seem to be able to structure their time usage so that contact to a network is not absolutely essential.

Technological difficulties too often cause difficulties. For example, delivering WLAN support for a big hotel complex is a complicated task, as it is on ships where steel walls are a major obstacle to the transmission of signals. Technological standards are also unclear and uncertainty remains as to which technology to use.

Maybe the most dramatic reason for the slow take-up, at least in Finland, seems to be that businesses in the travel and tourism business see catering for wireless connections as a marginal business. The Finnish teleoperators, with TeliaSonera dominating, seem to be running what business there is. One further aspect is that of delivering user support for the telecommunication services. Currently it is clear that this is going to be a business for a company which takes care of its customers, which most likely means the teleoperator. Hence, delivering user support seems unlikely for the tourism industry based companies as it is not connected to their respective business models. Furthermore, many business travel companies rely on providing a very good service and they fear that delivering a bad service for network connections would negatively affect their service level image. It may be argued that wireless customers are also marginal to companies in the tourism industry as they have not invested enough in the development of business models to be able to develop wireless connections.

In summary, we discovered that wireless technology is not in widespread use in the studied organizations. Currently only some physical areas were covered with wireless systems by the companies studied. The explanation as to why wireless technology is not more popular is related to the problems of providing a mobile WLAN environment rather than the travel industry. For example, the limited number of wireless areas and security concerns are typical of barriers and concerns that dissuade people from connecting to a portable terminal. Also the costs of the terminal equipment and communications expenses are probably restrictive.

This does not directly mean that wireless systems are not needed by customers. For example, Restel won long-term customers because of its WLAN-networks as many foreigners set up long-term offices in the company's hotels. Most new office buildings are to be equipped with wireless infrastructure and WLAN is also being built into existing facilities. Consequently, the coverage of wireless systems will spread in the future. At the same time new mobile internet connections make the world clearly more wireless.

When new information systems and technical infrastructures are being developed the needs of the user should be understood. Most users do not appreciate technical sophistication as such and what they need are systems that are reliable and easy to use. This is one key explanation behind the increasing success of mobile broadband connections.

When searching through the material gathered it became clear that in the Nordic countries kiosk-like activities are less developed than in the rest of the world. In many Southern and Central European countries and in the UK it is typical to see Internet cafés, or kiosks offering wireless and wired Internet access services. In the Nordic countries, these are harder, but not impossible, to find and travellers are more used to having Internet access when they have a stop-over and convenient time for using the Internet, such as being in a hotel room or stopping over at an airport or bus or railway station.

Table 1: Reasons for not widely adopting WLAN's

	Restel	Silja Line	Finnair	CAA
Limited customer demand	WLAN connections have brought some long-term customers, otherwise low demand **	Most customers are leisure travellers resulting in limited demand * * *		
Technical difficulties		Delivering broad bandwidth from a ship is difficult **	Delivering any connection from a plane is difficult **	
Unsettled business models	Business outsourced to the teleoperator – little incentive for Restel * * *	Business outsourced to the teleoperator – little incentive for Silja Line * * *		Business outsourced to the teleoperator – little incentive for Restel * * *
Service delivery difficulty	Difficult to deliver user support with own staff ***	Difficult to deliver user support with own staff ***		
Key	* = some importance	* * = reasonable importance	* * * = strong importance	

In the future, wireless systems will be more popular. However, our longitudinal study showed that no radical changes in the industry had taken place over a period of four years because of complicated business models and the fact that the available technology is still less than optimal in use. Up-to-date and easy WLAN and Internet connections are available, but not for the budget traveller. While for the long-haul traffic of ships and airplanes even technical problems still persist.

The later interviews conducted with teleoperators indicate that changes are possible as flat rate mobile broadband connections are becoming increasingly popular among travellers. They offer ease of use, speed and are attractively priced. However, at the moment, such pricing applies only for mobile users who have a "domestic" flat rate connection but any visitor to Finland would have to pay high prices for accessing the internet through GSM networks. Technically, a mobile user can connect to the Internet and other network services from practically any location. For travellers this can be valuable but also costly. Thus, it is worth noting that the leisure traveller who wants to be unreachable is going to have a harder time arguing for non-

communication due to technical reasons but an argument based on cost will seemingly persist for some time to come.

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Appendix - Interviews

2003 round			
Alarvo, Esko	Chief Information Officer	Restel Oy	11.11.2003
Vapaavuori, Raimo	Chief Information Officer	Silja Line Oyj	03.12.2003
Lummejoki, Kari	Network Management Office rSilja	Silja Line Oyj	12.12.2003
Björklund, Eeva	Chief Information Officer	Civil Aviation Authority in Finland	18.12.2003
Hänninen, Kari	Chief IT, infrastructure services	Finnair Oyj	18.12.2003
2008 round			
Ulaska, Henry	Industry area manager	TeliaSonera Finland Oyj	27.05.2008
Iilahti Patrik	HomeRun Nordic product manager	TeliaSonera Finland Oyj	13.06.2009
Varsila, Timo	Head of Products	DNA Finland	05.05.2008
Lehti, Panu	Executive Vice President	Elisa Oyj	28.05.2008
Lankinen, Heikki	Research Manager	Finnish Hospitality Association	26.05.2008

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