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A Feasibility Analysis of a Mobile Interface for a Web Site

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ABSTRACT OF THE
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Internet web sites are being used with desktop and laptop computers and mobile pocket devices. In this thesis the feasibility of a mobile interface project of Jatkoaika.com web site is analyzed.

STOF model, a research method, is used as a tool to evaluate business models for the web site's mobile interface. The business model has two important factors. User's mobile browsing experience is on the service and technological domains of STOF and the revenue model for the mobile interface in on the financial domain.

A user questionnaire was conducted to confirm the literature study on the mobile usage preferences of the users. To model the finances, estimations are done and sensitivity analysis are used to evaluate the results.

The work reaches the conclusion to recommend building a simple mobile interface for the web site. Overall the mobile web business is seen as small at the moment, but at the same time clearly growing area, where involvement would be beneficial.

Keywords: Mobile web, mobile web interface, STOF model, mobile service development

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Internetin verkkosivustoja käytetään tietokoneilla, kannettavilla tietokoneilla ja kannettavilla mobiililaitteilla. Tässä työssä tutkitaan Jatkoaika-verkkolehden mobiilikäyttöliittymäprojektin toteutettavuutta.

Työssä käytetään STOF-mallia työkaluna mobiilikäyttöliittymävaihtoehtojen liiketoimintasuunnitelmien arvioimiseen. Liiketoimintasuunnitelmassa on kaksi tärkeää tekijää: käyttäjien mobiiliselauskokemus STOF-mallin palvelu- ja tekniikkakentissä ja sivuston ansaintamalli taloudellisessa kentässä.

Käyttäjäkysely toteutettiin vahvistamaan kirjallisuuskatsauksessa saatuja tietoja käyttäjien mobiilikäytön mieltymyksistä. Projektin taloudellista puolta mallinnettiin ja estimoitiin työssä ja tulosten arvioimiseksi malleille tehtiin myös herkkyysanalyysiä.

Työssä päästiin johtopäätöksiin, jotka suosittavat yksinkertaisen mobiilikäyttöliittymän rakentamista. Kokonaisuudessaan mobiilin Internetin liiketoiminta vaikuttaa tällä hetkellä rajallisen kokoiselta. Se on kuitenkin selvästi kasvussa, joten siinä mukana oleminen olisi hyödyllistä.

Avainsanat: Mobiili Internet, mobiilikäyttöliittymä, STOF-malli, matkapuhelinpalveluiden kehittäminen

Preface

This Master's Thesis has been written as a partial fulfillment for the Master of Science degree in Aalto University School of Electric Engineering. This thesis was conducted for Jatkoaika ry, which has played an important role in my life also outside my studies.

I wish to express my gratitude to those who helped me through with this work. Firstly, supervising professor Heikki Hämmäinen for his valuable comments and insights regarding the topics of this thesis. I would also like to thank my instructor Matti Liljaniemi and Mikko Järvinen both from Jatkoaika for their help and instructions.

I would also like to thank my family for supporting me throughout my rather long studies, making them possible. Finally, I would like to acknowledge my friends, especially Kirsi Lilja, for supporting me during working on this thesis.

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Mikko Vuori

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Abbreviations

3G	Third generation
CDIs	Critical Design Issues
CI	Confidence Interval
CMDA	Code Division Multiple Access
CPM	Cost per thousand impressions
CSFs	Critical Success Factors
CTR	Click through rate
EDGE	Enhanced Data rates for GSM Evolution
GPRS	General Packed Radio Service
HSPDA	High-Speed Downlink Packet Access
HTML	HyperText Markup Language
IEEE	Institute of Electrical and Electronics Engineers
IRR	Internal rate of return
MMS	Multimedia Messaging Service
NPV	Net present value
PDA	Personal Digital Assistant
SMS	Short Message Service
STOF	Service Technology Organisation Finance
UMTS	Universal Mobile Telecommunications System
UX	User experience
WAP	Wireless Application Protocol
WLAN	Wireless Local Area Network
WTP	Willingness to Pay
XHTML	eXtensible HyperText Markup Language

1 Introduction

1.1 Motivation

Browsing web sites with mobile devices has become increasingly popular in recent years. However, mobile connections and mobile devices have several properties that affect the mobile browsing experience. This is especially true when users browse regular web sites with their mobile devices. Because of this, special mobile interfaces for web sites are often developed for mobile users.

The mobile interfaces usually feature only part of the content of the corresponding full web site. The amount of data to be loaded is smaller, which makes the usage faster. Also the navigation on the site is intended to be simpler and easier even with a mobile device. These changes have an effect on the use of the site, which in turn changes the operation of the site's publisher.

From technical point of view simple mobile interfaces can be developed reasonably easily. However, the actually effects of a mobile interface on overall site traffic and revenue are harder to evaluate. This work focuses on making an educated choice from business point of view when developing a mobile interface and analyzing feasibility of the mobile interface options.

This work is done with the case of Jatkoaika.com web site. This sports web site's content includes news and other topical material. In year 2010 the site had from 150 000 to 180 000 unique visitors per week. So far no mobile interface is implemented, which means that the mobile users have to use the regular web site. The site's business model is based on advertisement income of the regular web site.

1.2 Research question and objectives

The main objective of this thesis is to find a solution on how to serve the mobile Internet users on the Jatkoaika.com web site so that it is beneficial to the publisher too. This means finding out what type of mobile interface would be most beneficial for the site, or if it is not feasible to invest into a mobile interface at this point. The main criteria for selecting a solution is short term financial viability of the selected solution.

The research problem is presented with the following research questions:

- RQ1: Is there demand for a mobile web interface? What type of mobile interface would have the most demand?
- RQ2: Which are the key factors when building a mobile interface?
- RQ3: How viable are the revenue models that could be used for the mobile interface?
- RQ4: Which strategy would be recommended for the mobile interface project?

1.3 Scope

The scope of this thesis is narrowed down to the big questions of the project. By answering the research questions, the work intends to give guidelines on how the mobile interface development project should go from the start.

No detailed technical plan for building a mobile interface or a prototype of the mobile interface is going to be developed in this thesis, nor are any definitive financial numbers calculated. Instead, the results of this work are intended to help evaluate opportunities of building a mobile interface.

The work is limited to discussing ways to build an interface for mobile users. Other ways to present the content for mobile users, like downloadable applications or selling the content to third party for bundling are not considered.

1.4 Research methods

A literature survey is used to study the mobile browsing experience from user point of view and to understand revenue models for a mobile interface. The case is analyzed in more detail by using usage statistics and by conducting a user questionnaire. The questionnaire is designed to confirm literature information on mobile usage.

A STOF model (Bouwman et al., 2008b) is used to get a comprehensive view of the different domains the mobile interface project works on. This is done by finding out which are the key factors to consider in the planned business model for the mobile interface.

A financial model is developed to estimate the financial viability of a mobile interface. The model includes the costs and the revenues of the mobile interface, which are estimated based on the literature survey and the user questionnaire. A sensitivity analysis is performed on the models to get a clearer understanding of the validity of the results they provide.

1.5 Structure

The second chapter introduces the academic study that forms the background for this thesis. This includes mobile business and its business models, mobile web browsing, the models for mobile interface revenues and an introduction to some of the research methods used.

The third chapter introduces the Jatkoaika case in more detail and motivates the study. Also the questions and results of the user questionnaire are presented. The proposed solutions are evaluated from different perspectives using the STOF model. The finances of the mobile interface are also modeled and estimated.

In the fourth chapter the research methods and results from the third chapter are analyzed and the research questions are answered. The fifth chapter presents the conclusions of the work based on the analysis.

2 Background

In this is chapter the background for the thesis is presented. First, the mobile business and relevant business models for mobile services are discussed briefly in section 2.1. Then mobile browsing is discussed in section 2.2 and mobile Internet in Finland in section 2.3. Revenue models for mobile web interfaces are looked into in more detail in section 2.4. Also some of the research methods used in this thesis are viewed in section 2.5.

2.1 Mobile business

In this section, an overviews of mobile business and its segments are presented. Especially mobile Internet is considered. Also basics of a business models for mobile services are discussed based on the STOF approach.

2.1.1 Business overview

The mobile business has changed a lot during the last decade, due to the evolved technologies related to it. The technologies for mobile connections and the mobile devices have been developed a lot during the time frame, which allows other services than just conversation on the mobile context.

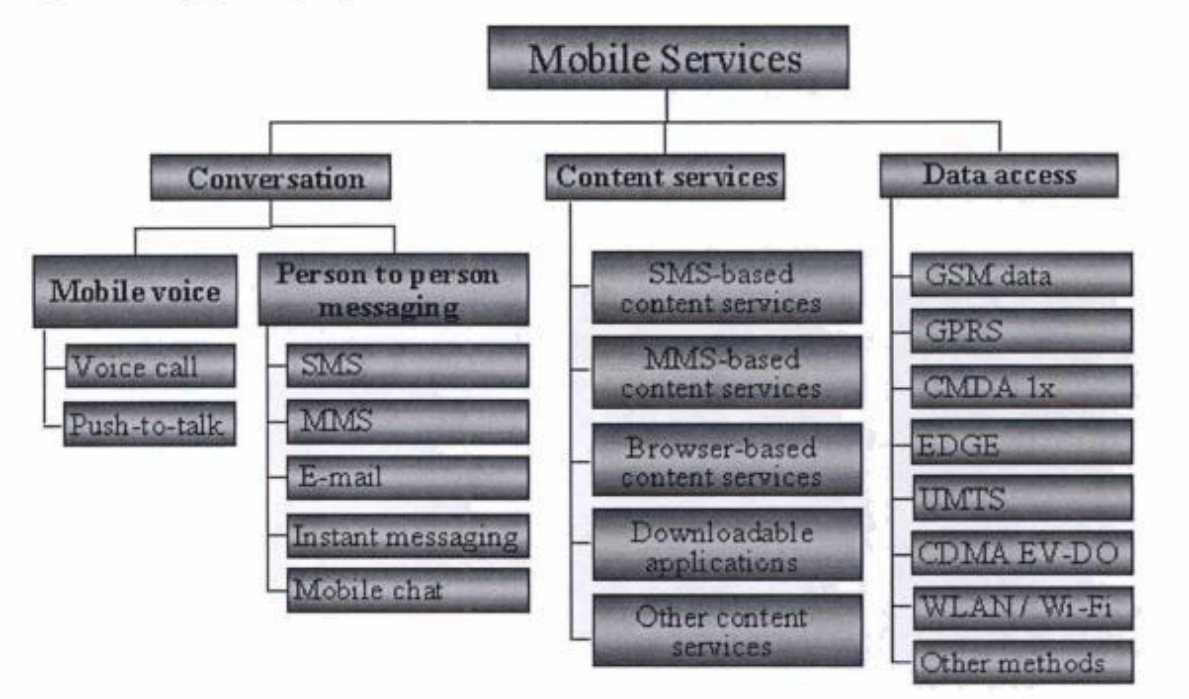

Figure 1: Topology of mobile services (Vesa, 2005)

Based on various categorizations of mobile services, Vesa (2005) presents a topology

of mobile services, which is shown if Figure 1. The three main categories are conversation, content services and data access. Conversation includes voice-based services and nonvoice messaging like SMS, MMS and e-mail. Content services consist of SMS- and MMS-based content services, browser based services and downloadable applications. Data access category includes the various transfer methods available to be used for the services in the two other categories.

Soininen (2005) distinguishes five major business areas or segments on the mobile Internet environment, which are shown in Figure 2. Those are networks, devices, operating systems, content, services and applications and support services and regulation. The end-user is connected to these segments by using a device, which has an operating system and is connected to a network. The user then accesses content, services and applications.

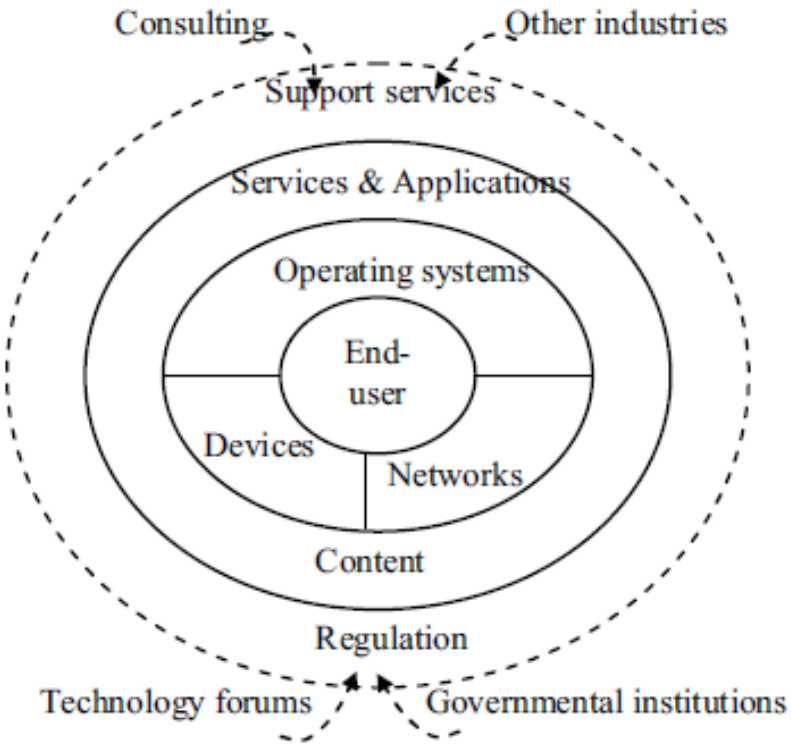

Figure 2: Segments of mobile industry (Soininen, 2005)

The mobile web interfaces this thesis focuses on are on the content segment and are more specifically browser-based content services. Thus, the properties of those two areas are considered in particular. The other segments and services also affect the mobile interfaces.

The content on consumer markets can be divided into information and entertainment. Entertainment services contains ring tones, pictures, mobile gaming and music and video, while information is defined as news, timetables, navigation, mobile banking and so on. Other ares of content could be mobile shopping and mobile

wallet. There are several ways for a content developer to offer their services. In addition to offering them straight on, the developers can collaborate with different content aggregators and portals to bundle and supply the services to customers. For example, network operators might license services from content developers. Soininen (2005)

2.1.2 STOF model

A company's business model describes the economic logic for delivering customer value for a cost that allows the company to make profit. Thus, a business model is essential for a successful organization. However, a business model is not the same thing as a company's strategy, which also deals with how the company intents to perform effectively in the competitive environment. (Magretta, 2002)

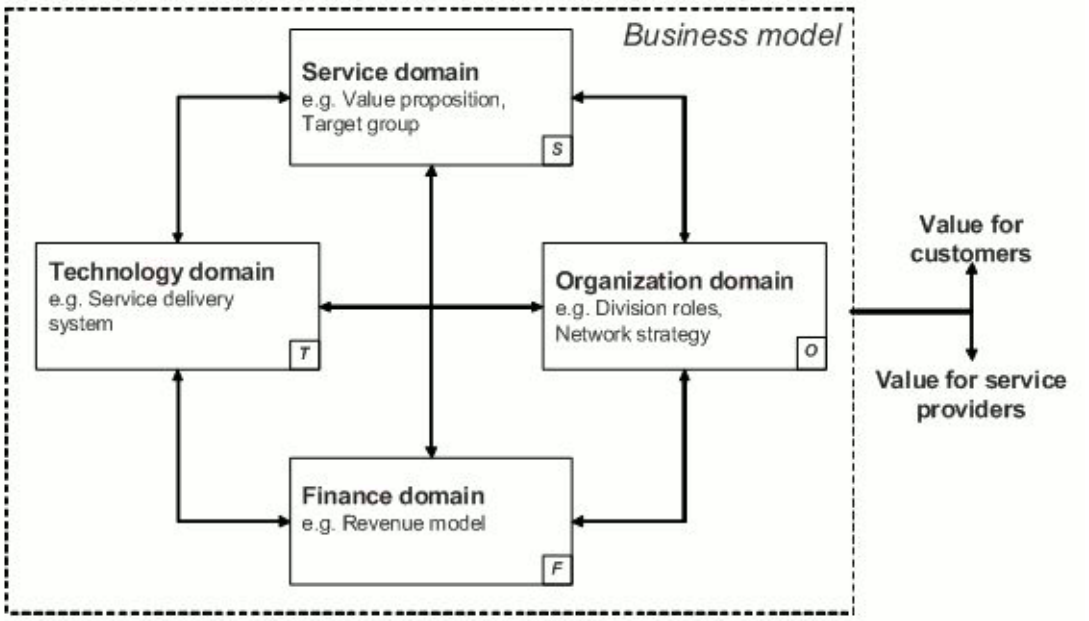

Figure 3: The components of a business model (Bouwman et al., 2008b)

Bouwman et al. (2008b) introduced their STOF view of business models for mobile services in 2008. The acronym stands for service, technology, organization and finances, which are the four domains of the model. The domains are illustrated in Figure 3.

In the STOF approach satisfying customer demands is viewed to be the most important aspect of a business model. That means the customer value of a product or service is the starting point of STOF. This is done by starting from service definitions and focusing on the value proposition. Technology is not seen as the most important thing. Although it is important in innovative services, it is only an enabler from the customer perspective. It is important that all the domains are in balance, because that is a required for the business model to be effective.

Next the important factors in each four domains are described in more detail.

- *Service:* Service domain is the starting point for STOF approach. The service must satisfy customer needs and wants and provide valuable experience. In mobile environment, new innovations can lead to new successful products. However, intended value and the value the organization is able to deliver to customers are often different. This can be due to several reasons, such as technical, organizational and political reasons. User might also experience different value than what was actually designed or delivered. Mobile services particularly provide value by transcending space and time and enhancing communications and information access. The services usually either solve a particular problem or are entertainment services. One service does not fulfill the "anywhere anytime" mantra, but the service instead works in some particular context where it is useful for the users. Another key feature of services is personalization, since personalized services can often better suit user needs.

- *Technology:* The requirements of the service determine the technical architecture needed for the service. The architecture describes the technology components used for providing the service. Technologies needed and the organizations that supply the technologies are directly linked. When the service is personalized for users, the technical issues include authentication of the user and user profiles. Another important factor is the security of the service, which mainly means the security the users perceive.

- *Organization:* Organizational issues mainly consist of issues around organization's resources and capabilities. They are related mainly to technology, marketing and finances. Even if the service is offered as one organization, there are often many organizations that collaborate in creating the service by providing different resources and capabilities. Since multiple organizations are included, the organization domain also includes the relationships and the agreements between the different organizations. The goals and strategies of these organizations are also included in the domain.

- *Finances:* Finances define the bottom line for most of the services. Thus investment decisions and revenue models are important for new services. They include the following components: Costs include transactional costs and fixed and variable costs. Typically the costs in mobile business have high ratio of fixed costs compared to variable costs. Revenue models indicate what methods of payment are used and what is being paid for. This means essentially how money is made. Also affecting the finances is the model used for pricing. Some possibilities are payment per download and subscription. Pricing is important, since user value and production costs of the service have no direct connection. This also allows personalized pricing in some cases. Risks can be both positive and negative and the like hood and consequences have to be estimated. Risks can result from technological possibilities, technology availability, standards and other factors.

Business models can be designed based on the four domains and their important factors. However, the models are dynamic and constantly changing, when the surroundings change. The next section takes a closer look on building a successful model with STOF approach.

2.1.3 Building a model

The STOF approach not only describes what is needed for a successful business model, but also outlines the process for building one. Vos and Haaker (2008) describes building a business model as a process, which is illustrated in Figure 4. The process includes the following four steps:

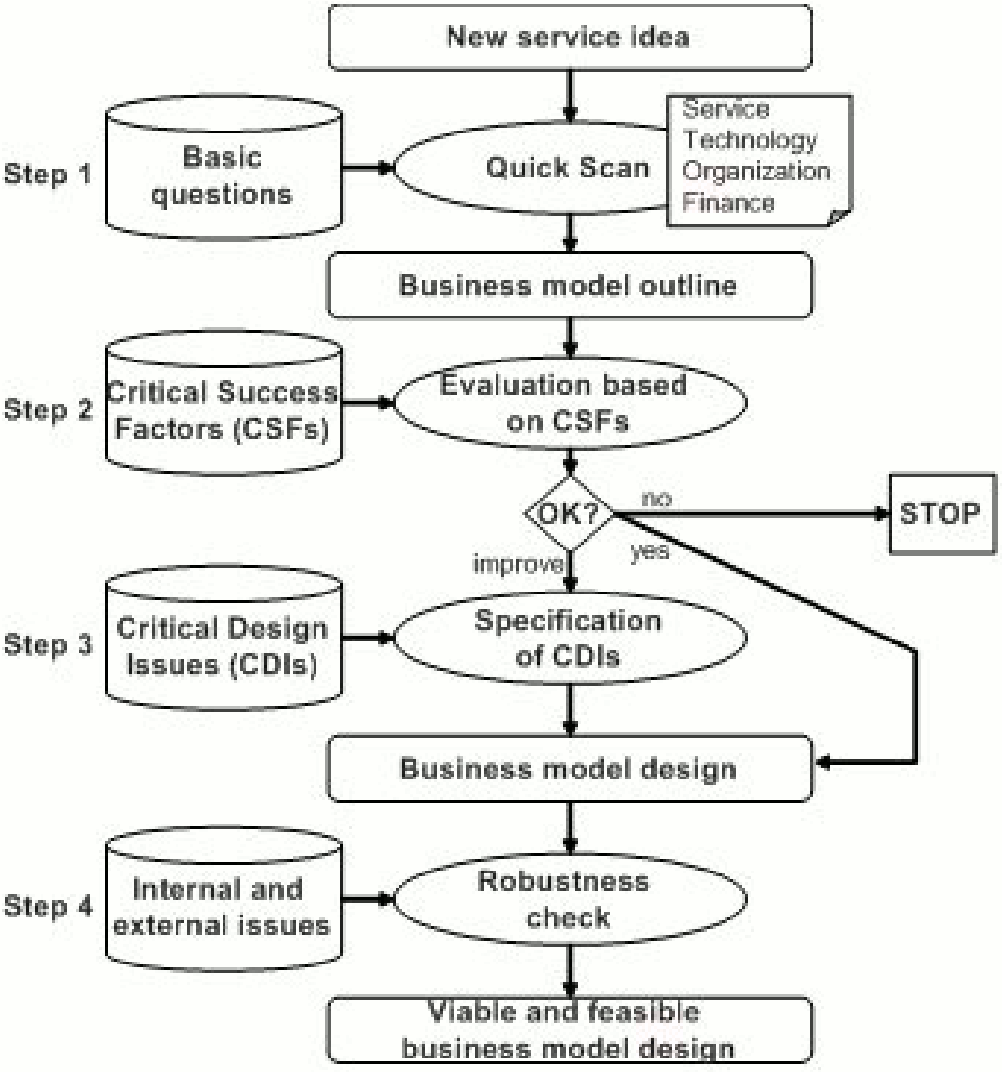

Figure 4: Design steps in STOF method (Vos and Haaker, 2008)

- *Quick scan:* First step is the initial sketch of the business model. The step includes description of the service and intended value proposition from customer point of view, which is the starting point. Typical questions in this step are "who is the customer?", "who is the user?", "what is the specific service and why would user use and pay for it?". After considering the customer point of view, technology, organization and finance domains are designed.

- *Evaluation with critical success factors:* The second step is to evaluate the model with the critical success factors (CSFs). This helps to determine which parts of the model need to be changed. CSFs that create customer value are: (1) Clearly Defined Target Group, (2) Compelling Value Proposition, (3) Unobtrusive Customer Retention and (4) Acceptable Quality of Service. The CSFs that create network value are (1) Acceptable Profitability, (2) Acceptable Risks, (3) Sustainable Network Strategy and (4) Acceptable Division of Roles.

- *Specifying critical design issues:* The third step is to refine the quick scan with critical design issues (CDIs). CDIs are related to design choices and connected to CSFs. CDIs are the factors that affect the effectiveness of the business model of mobile service the most. There are several CDIs on each domain, as shown in Table 1. Domains are refined one domain at time. In the end it is checked that the domains are in balance. Step 2 and 3 can be repeated when needed to get the model working and balanced.

- *Robustness check:* In the final step the model is checked for robustness, which means ability to cope with changes in business environment, and adaptivity to external influences.

The result of this process should be a viable business model. The model should offer users meaningful value, be financially feasible and be able to adjust to changes.

2.1.4 Summary

In this section, the basics of the mobile business environment were explained and categorized. Also the STOF model was discussed. It outlines the key factors in mobile service business models and is going to be used in this work to evaluate proposed solutions. Next the mobile web browsing is looked into from the point of views of technology and user experience.

2.2 Mobile browsing

In this section, mobile browsing in discussed in general. In section 2.2.1 the way mobile browsing is understood in this work is defined. Section 2.2.2 covers the various limitations mobile browsing experience has compared to the Internet browsing done with desktop or laptop computers. Section 2.3 discusses the usage of mobile Internet in Finland.

Table 1: Critical Design Issues in each domain of STOF model. (Vos and Haaker, 2008)

Domains	Critical Design Issues	Description
Service	Targeting	How to define the target group?
	Creating value elements	How to create value for the targeted users of the service?
	Branding	How to promote and brand the service?
	Customer retention	How to stimulate recurrent usage of service?
Technology	Security	How to arrange secure access and communication?
	Quality of service	How to provide for the desired level of quality?
	System integration	How to integrate new services with existing systems?
	Accessibility for customers	How to realize technical accessibility for the service for the target group?
	Management of user profiles	How to manage and maintain user profiles?
Organization	Partner selection	How are partners selected?
	Network openness	Who is allowed to join the value network?
	Network governance	How is the value network orchestrated? Who is the dominant actor?
	Network complexity	How to manage increasing number of relations with actors in a value network?
Finance	Pricing	How to price the service for end-users and customers?
	Division of investments	How to divide the investments among business partners?
	Valuation of contributions and benefits	How to measure and quantify partners' contributions and (intangible) benefits?
	Division of costs and revenues	How to divide the cost and revenues among business partners?

2.2.1 Definitions of Mobile Browsing

The terms mobile browsing and mobility can be defined in numbers of ways. Next some of these term are defined as they are relevant to this work.

- *Mobile device:* In addition to desktop computers there are several other devices available: laptops with network access, mini laptops, mobile phones, smart phones, PDAs and tablet devices. As the devices are developing all the time, the boundaries between the devices are becoming blurry. However, in this work the mobile device is considered mainly to be a contemporary mobile phone or smart phone that is capable of web browsing.
- *Mobility:* Mobility can mean different things. Mobility of the user means that user can log on from different devices and get the same content. Mobility of the device means the device can move and connect to the network with some wireless network. It is also possible to discuss if the user of the mobile device is concretely moving or stationary, for example sitting down or walking (Cui and Roto, 2008). In this work the mobile browsing is considered to be web browsing done with mobile device, regardless of whether the user is moving or not.
- *Mobile browsing:* The usual way to access data on Internet with mobile device is to use browser and open a web site. The web site the user uses can be either the regular web site or specially mobile tailored version of the site. The other option would be to use an application that is developed to uploading or downloading content from specific source on the Internet. (Kaikkonen, 2008) These options are showed in Figure 5. In this work covers only browsing of either the regular web sites or mobile interfaces of the sites, as the focus is on transferring the web magazine to mobile use as such.

2.2.2 Mobile Browsing Experience

User experience (UX) is defined as *"a person's perceptions and responses that result from the use or anticipated use of a product, system or service"* (UXIsoStandard). Mobile web browsing experience has some limitations compared to the more traditional desktop computer browsing.

However, the limitations are changing and are mainly getting smaller as technology improves. Some of the limitations are easier to overcome with technology than others. The limitations mainly affect the usability in mobile browsing. Roto (2006) divides the mobile browsing experience in the following four categories, which can be seen in detail in figure 6:

- Mobile device

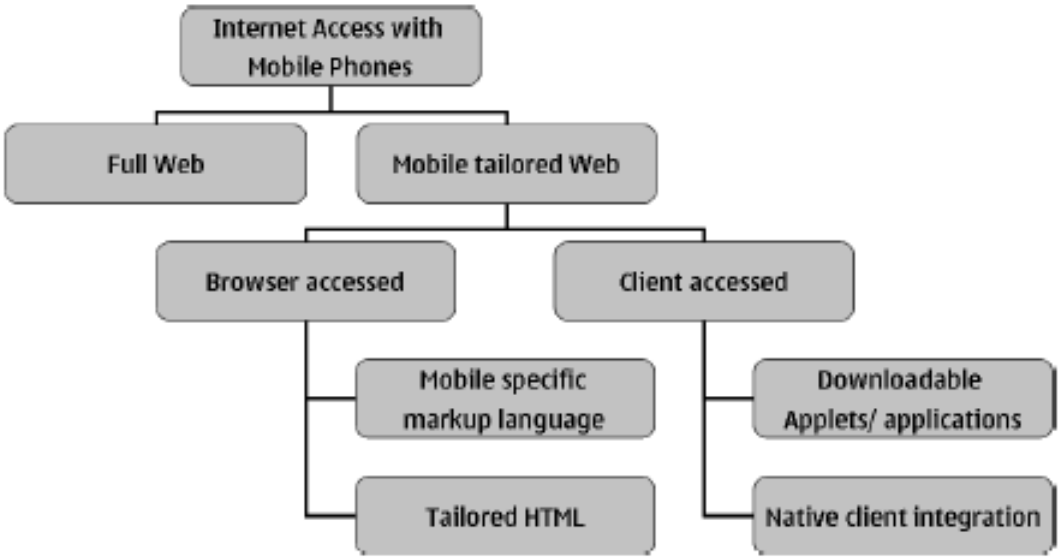

Figure 5: Landscape of Mobile Internet (Kaikkonen, 2008)

- Browser
- Connection
- Site

Next the important factors on these four categories are discussed in more detail.

2.2.3 Mobile device

The mobile device and its usability and performance are arguably the biggest factors in mobile browsing experience. Roto (2006) lists the key properties of mobile device that affect the user experience as following:

- *Usability:* **The sizes of displays** on the mobile devices are smaller than the screens of computers in both the physical dimension and the resolution. Both of those also vary from device to device. (Kaikkonen and Roto, 2003) The smaller resolution makes it harder for users to find information on the page. There might be a need for lots of scrolling to see the desired content. The small screen is actually demanding for user's short term memory and makes completing tasks 50 percent harder. (Shrestha, 2007)

  The controls of the device include the keys to input text and numbers and to scroll the pages and select the links, among other things. The main problem with keys is that the input of text is slower than with computer keyboard (Kaikkonen and Roto, 2003). The current touch screen devices and other new smart phones have a full QWERTY keyboard which makes the text input

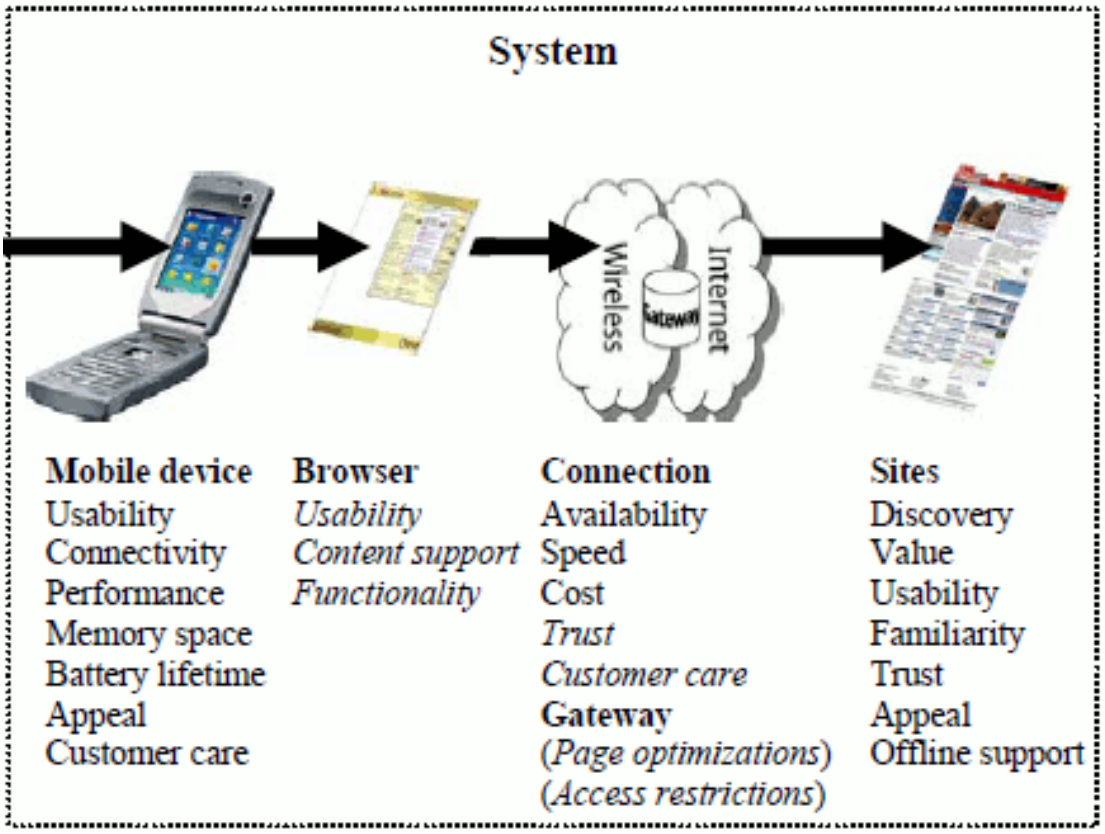

Figure 6: Mobile browsing user experience factors (Roto, 2006)

easier than with previous number key devices. Still the keyboard might not be as convenient to use for example with capital letters as a computer keyboard. This causes problems for users to input passwords (Shrestha, 2007). Having no mouse to select and activate objects can cause problems (Kaikkonen and Roto, 2003) and even the touch screen is not really much easier to use for scrolling the web pages or selecting links, especially if the link texts or images are small or consist of only a couple of characters (Keinänen et al., 2010).

- *Connectivity:* It is important that devices support different types of networks. Support of WLAN is important for users, since it provides faster and cheaper mobile browsing. The device should also be able to connect to local cellular networks even if they are different in different countries. Overall, good connectivity means that the device is able to automatically utilize the fastest or cheapest connection available, depending on what the user wants. The connections should also work without configuring. (Roto, 2006)

- *Performance:* According to Roto (2006): *"Mobile browsing speed is determined not only by the connection speed, but also by device performance. The delay from clicking a link to the point when the next page is scrollable is the key performance meter for mobile browsing, and the delay consists both of the data transfer over the connection, and the time the device renders the page."*

- *Memory space:* Amount of memory the device has affects the caching of the pages that have been already browsed. When a page is in the cache, the data does not have to be reloaded when user steps back in the browsing. (Roto, 2006)

- *Battely lifetime:* Battery usage also affects the browsing with mobile devices. Users have the mobile phones for communications purposes and want to be able to make and receive calls and text messages. If the battery level is low, users control their service usage. Connection to network consumes battery, especially if the connection level is not good. (Kaikkonen, 2009) Features such as bigger display also consume more battery and battery is limited by the smaller sizes of the devices. Devices with better power management and better batteries are more usable for mobile browsing.

- *Appeal:* Appeal includes user's attitude toward the design and the brand of the device. Browsing on a device users like might be more enjoyable than on a device they do not like, even if the functionality is basically the same. This affects also the studies and tests on user experience. (Roto, 2006)

2.2.4 Browser

The browsing experience is affected by the browser itself. Roto (2005) lists interaction, page rendering and caching as the main components that affect usability of a browser.

Interaction consists of several aspects. The overall speed and easiness of use are key components. As the devices do not necessarily have great controls, the browser might have to contain some clever ideas on how to make navigation easier. For example, zooming and panning are options that are included in the newer browsers, like Opera 9.5 (Vaughan-Nichols, 2008).

The rendering of the pages includes the effectiveness of the rendering, which affects the speed, and the way the page is shown on a smaller screen. With today's Web 2.0 sites, the rendering of interactive web services and running applications such as Adobe Flash have to be considered, as they are used on number of websites today (Vaughan-Nichols, 2008). If these components are not working it might be confusing to the users, as they are not sure if the elements are shown properly or not and whether the page has been fully loaded or not (Keinänen et al., 2010).

Some of the browsers are delivered with the phone, but some of the more advanced ones are manufactured by a third party, which means users need to find out and download those browsers themselves. Some of the current browsers include Apple's Safari, BackBerry Browser, Google's Chrome Mobile, Internet Explorer Mobile, Mobile Firefox, Nokia Series 60 browser and Opera Mobile, which run on several different platforms. These browsers can better work with today's web services and Web 2.0 applications (Vaughan-Nichols, 2008). Since the mobile devices are fragmented, such a large number of different browsers is not a surprise. The upcoming HTML

5 is going to include new elements that should help structuring a web page and rendering same content differently on different devices. In mean time the combination of HTML and JavaScript is becoming powerful platform on the newer browsers. (Reynolds, 2009).

There been a lot of study on how regular web pages could be better shown on a smaller screen devices, which for example Ahmadi and Kong (2008) present. However, if the users are familiar with the full web site on their desktop computers, they might expect the same site on their mobile devices. Trying to render a regular web site differently on a mobile device has not been a popular approach in last couple of years.

Server transcoding The current browsers provided with mobile phones use direct delivery paradigm, like the browsers on desktop computers. The device renders the web page from the data it gets from the web server. However, it is possible to use server transcoding paradigm. In that case the requests from the device are sent to a proxy server and the web page is rendered on the server. After that the page is sent to the device in a format the mobile browser renders. (Hernandez, 2008)

There are several vendors creating thin client browsers that use the server transcoding paradigm. These clients include Opera Mini, Bitstream's ThunderHawk and Skyfire Labs' Skyfire. The server rendering reduces the data transfer by up to 80 percent and decrease the need for computing power on the device. This increases browsing speed and reduces battery usage. (Vaughan-Nichols, 2008) The mobile browsing is also affected by the network latency. Every connection from the client to the server can have a delay of a couple of seconds before the data transfer. When server trascoding is used, the connections from the client to server can be kept minimal, as the proxy server can return the data in one package. (Lehtonen et al., 2006) Normal HTML web pages use several files, for example images, that must be requested separately. The two methods are illustrated in Figure 7.

Servers are needed to do the rendering if the server transcoding paradigm is used and implementation and management of a server infrastructure is also needed (Hernandez, 2008). This means there are costs to run such a system. The mobile device vendors might have to pay licensing fees to have such a browser for their phone (Vaughan-Nichols, 2008). Opera also gets money from networks operators for branded versions of their browser and advertising money from searches (Hakola and Lahti, 2006). However, it is unclear if such a business model can be profitable in the long run. The server transcoding paradigm browsers seem to be in the minority at this point.

2.2.5 Connection

Roto (2006) lists availability, speed, cost and trust as the factors that affect the usability of a mobile connection.

- *Availability:* Depending on the network characteristics, the network coverage

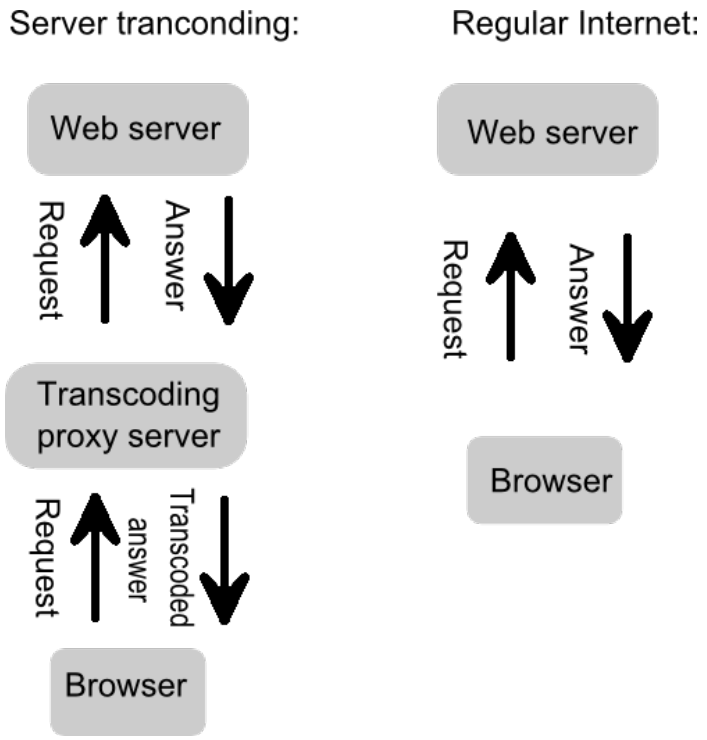

Figure 7: Server transcoding and direct delivery methods.

might not be available in all areas, or the network might not have newer specifications like 3G available in some areas. In Finland, the coverage is very good (Roto, 2006).

- *Connection speed:* The connection speed affects the loading times of the web pages the users are browsing. According to a survey, site load time is the biggest source of dissatisfaction for mobile Internet users (Online Publishers Association, 2007). The speeds of the current connections are increasing: today's HSDPA connections on 3G networks support at least 1.8 and up to 14.0 Megabits per second downlink speeds. The speed of the connection becomes much less of a limitation if a WLAN connection is available and the device supports it. The current standard IEEE 802.11-2007 offers speeds up to 54MBit/s (IEE, 2007).

- *Data cost:* The cost of the data transmission has been traditionally a big factor in mobile browsing. The cost might have been very high or at least too high for reasonable use. The costs are hard to predict as they have been based on the amount of data transferred. Roto et al. found out in interviews that costs are a major influencer in mobile browsing since they are hard to understand and follow. This problem has become much smaller with flat rate pricing on mobile Internet. Some times WLAN connections are available, which also helps to lower and control the costs (Roto, 2006).

- *Trust:* Users must have trust in the connection and the service as whole, as it

is not always clear from which part of the service security issues might arise. User trust in mobile services includes perceived reliability of the technology and the information and functions provided (Kaasinen, 2005). User expects that nobody is following one's data traffic. Browsing has to be secure especially when the user discloses personal information, like credit card number. Especially open WLAN networks might be vulnerable to security threats. Trust also includes the user expecting the connection to be available for the whole browsing session. (Roto, 2006)

2.2.6 Site

One important thing that affects the usability of mobile browsing is the web site that is being used. The previously discussed factors like the device and the connection are matters that depend on the manufacturers of the devices and network operators. The site design can be decided by the site publisher. Because of this, the site usability is important for this work. Roto (2006) lists discovery, value, usability, familiarity and appeal as the main components of usability of a web site.

Discovery: Discovery contains finding a site, often by using search engines (Roto, 2006). The discovery of the site applies also to the users of the regular site. If they do not know that a mobile version of the site exists, they might use the regular site with a mobile device or not access the site on a mobile device at all.

Value: Mobile browsing has some usability limitations that affect the possibilities the users have for mobile browsing. In addition to the limitations, the users can also have preferences to use the desktop computers to do some browsing tasks and use mobile browsing in different time for different tasks. For example, it would seem likely that mobile browsing would be used for time critical tasks when desktop computer is not available.

Anderson et al. (2001) categorize mobile Internet usage based on user browsing behaviors. They list random surfing, task completion and information-goal seeking as different patterns of mobile browsing. The environment in which mobile browsing is conducted does not support detailed information searching. As a result, mobile users prefer quick and easy access to information and services (Mobile Marketing Association, 2009).

The mobile usage has another clear difference compared to the desktop usage. Kivi (2005) found that mobile browsing is concentrated into few web sites. In the usage measurements top five sites made up 69 percent of all the visits the panelist made. This seems logical that users tend to use the sites they are most interested in and know the best. This is because familiar sites are easier to navigate even with the limited mobile devices.

Schmiedl et al. (2009) classified the web sites Austrian users mentioned using with mobile device. In the research 70 percent of the content was current or general information, 17 percent entertainment and 13 percent social networking.

Usability: Kaikkonen and Roto (2003) studied the structure of mobile WAP pages. The content is not quite comparable to current mobile interfaces of web sites, but some finding are interesting nevertheless. In the study the two different options for site structure were long pages and flat hierarchy or short pages and deep hierarchy. In the case of shorter pages there were more links that link users to more information. The longer pages had to be scrolled by users to get the rest of the information. The study showed that users complain more about the download times of the sites that have only a little data on one page. They felt that loading a longer page was acceptable. Also the optimal page length depended on the type of the page. For interactive pages the length that users found too long was much smaller than for informative pages.

Recently there has been some study on how full web sites and specially tailored mobile interfaces of sites are used by the mobile users. Some users seem to prefer the regular web sites even when they are viewing them with mobile devices.

Kaikkonen (2008) studied the usage of mobile Internet and found out that more than 50 percent of users browsing web on mobile devices use both regular web sites and mobile tailored versions. It is more common to use only tailored sites than to use just full sites: 14 percent of the users used exclusive full web sites and 32 percent only tailored versions. Full web sites are used, when user seeks specific information that is available only in full site or user did not know of the mobile interface. Full web usage was mostly utilitarian. Tailored interfaces were used for quick and specific information search, with time saving and convenience in mind. They were also used for time killing, which can be also hedonistic.

In another study, users were 30 to 40 percent faster performing tasks on a mobile tailored version of sites. However users were also annoyed that the tailored versions did not contain all the features of the full sites. In general users still preferred mobile tailored versions, even if the current mobile phones can be used to browse the full sites reasonably well. Since the devices are getting better and the connections more suited for data transfer, there will likely be more demand for new generation of mobile tailored interfaces. (Schmiedl et al., 2009)

Keinänen et al. (2010) found out that in actual cases most users prefer a mobile tailored interfaces. However, if they do not find the information they are looking for though the mobile interface, they switch to the full site. Thus it is important but tricky to decide what information to include on the mobile interface. The amount of content usually has to be limited. Site analytics providing access data can be used to determine how much the site is accessed from mobile devices and which content is mainly used. Whether it is sensible to build a mobile web interface depends on what the users use the site for. If the site does not have many tasks or the information structure is shallow, there might be no need for a mobile interface.

Familiarity: Users seem to be significantly happier using a mobile interface, if they are familiar with the layout and thus can navigate easier. Also the same usage patterns that users use with computers should be available to be used with mobile device, if possible. (Roto, 2006) This might be because the surfing behavior and

patterns seem to be the same in mobile web and the regular Internet (Halvey et al., 2006).

Appeal: Appeal means different things to different users, for example aesthetics, vibe, brand or so on. Some users might be unhappy, if the mobile interface is too stripped compared to the full version they know and are appealed to. (Roto, 2006)

2.2.7 Summary

The main result of this section is that the mobile browsing experience is affected by four main categories: the mobile device, the browser, the connection and the site used. In this thesis the first three of four are things to take into consideration when designed the fourth, the site. Next the mobile Internet particularly in Finland is looked into.

2.3 Mobile Internet in Finland

The mobile Internet usage has grown fast during last couple of years. This can be observed from two points of view: looking at the devices being used and looking at the usage of the network and the mobile subscriptions the users have.

2.3.1 Devices

Riikonen (2010) collected data from Finnish operators to get information on the handset being used in Finland. The study shows that the devices started to have packet data capabilities in the year 2009. The three most numerous devices had packet data capability and altogether 11 of the top-15 device had the capabilities. Overall over 80 percent of the handsets had GPRS capabilities and over 35 percent had HTML browser. The touch screen was not popular in 2009, as only two percent of the devices had the touch screen.

2.3.2 Connections

The number of mobile broadband subscriptions has been increasing fast over the last couple of years. Overall there was over a million subscriptions, which means almost every fifth person in the country has one. The development of the number of subscriptions can be seen in Table 2. (Viestintävirasto, 2010)

These subscriptions include both the subscriptions on the mobile devices and the mobile connections used with laptop computers. The number of data terminals is growing, which is partly explaining the growth of the mobile broadband subscriptions. In 2009 the share of data terminals was almost 8 percent, up from just above one percent in 2006. (Riikonen, 2010)

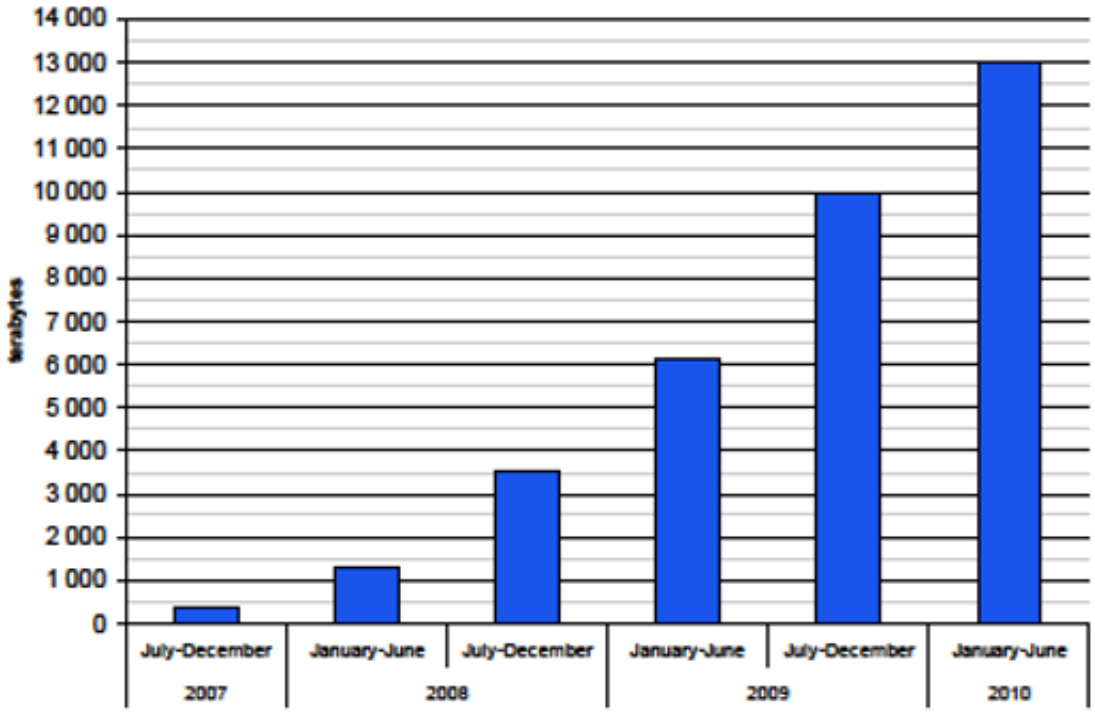

Figure 8: Mobile data transferred. (Viestintävirasto, 2010)

In addition to the number of mobile broadband subscriptions growing, the amount of data transferred in the mobile networks has also grown fast. For example, the volume increased 30 percent from the second half of 2009 to the first half of 2010. This growth of the overall data volume is a result of growth in two areas: the number of subscriptions and the amount of data an individual user transfers. The volume transferred is shown in Figure 8. (Viestintävirasto, 2010)

The growth of the number of broadband subscriptions happened at the same time as the flat rate pricing became more used by the operators. Lately there has been pressure to move away from full flat rate pricing and instead include monthly transfer volume quotas to the plans. In these cases the transfer rate would be drastically dropped after the quota is reached. One of the major operators Sonera has 1 GB

Table 2: Mobile broadband subscriptions (Viestintävirasto, 2010)

Date	Subscriptions
12/2007	143 100
6/2008	307 100
12/2008	479 700
6/2009	664 300
12/2009	908 000
6/2010	1 152 200

quota per month, after which the transfer rate is dropped to 64kbit per second (TeliaSonera Finland).

2.3.3 Sites

The usage of web sites through mobile interfaces compared to regular sites can be estimated in some ways. Since mobile interfaces can be much smaller in volume of data compared to regular interfaces, just straight forwardly comparing the transferred data from mobile web interface with the ones from regular ones does not give and answer, although some estimations can be made (Riikonen and Kivi, 2009). TNS Gallup (2011) lists mobile visitor statistics for some participating sites. The list includes mobile interfaces of some of the bigger media outlets' sites. The top three listed web sites are also in the top five on the regular web site listing.

Table 3: Mobile interface browsers, week 7/2011 (TNS Gallup, 2011)

Site	Mobile browsers	Browsers	Ratio
Helsingin Sanomat	157 790	1 797 605	0.088
Iltalehti	133 951	2 744 024	0.049
MTV3	98 611	2 046 265	0.048

When comparing the visitor numbers to the numbers of the regular sites, it can be seen that the usages of the mobile interface of a site is about 5 to 10 percent of the regular site. Again, this does not say anything of the usage of the regular web sites through mobile device. There could be a significant number of people using the regular sites with mobile devices. These visitor statistics are presented in Table 3 and 4.

Table 4: Mobile interface visits, week 7/2011 (TNS Gallup, 2011)

Site	Mobile visits	Visits	Ratio
Helsingin Sanomat	557 152	6 493 818	0.086
Iltalehti	495 800	15 078 579	0.033
MTV3	311 721	9 194 573	0.034

Riikonen and Kivi (2009) measured mobile traffic in Finland in 2008. The most mobile accessed general web sites include iltalehti.fi (newspaper), kauppalehti.fi (business newspaper), mtv3.fi (television channel, news site) and hs.fi (newspaper) while the most accessed mobile interfaces include the following news sites or web magazines: m.hs.fi (Finnish newspaper), yle.mobi (Finnish broadcasting company), wap.aftonbladet.se (newspaper, based in Sweden) and m.espn.go.com (General sports, based in USA). This list was created before mobile versions of Iltalehti and Kauppalehti were opened. Those sites might now have the mobile traffic shifted from regular sites to the new mobile interfaces.

So far most of these mobile web interfaces have been designed like previous XHTML WAP interfaces, but with some more graphical elements. The interfaces are tailored for narrow screen and include most topical news items on the top of the page and other news divided in different categories.

2.3.4 Summary

In this section, the mobile Internet in Finland was looked into using statistics of the devices, connections and mobile web usage. In a nutshell, the mobile Internet has clearly boomed over last couple of years. Also web sites with mobile interfaces were listed based on their popularity. Next, the revenue models for the mobile interfaces are discussed.

2.4 Mobile revenues

In this section, the models for generating revenue from mobile web sites are discussed. The income of a site can be based on advertising, subscription fees, some kind of combination of the two or other models. The factors affecting these options are described.

Investing in new ways to present content to users always includes financial aspects to consider. The old business could be cannibalized, if the new one reduces its profitability. This could potentially be the case for mobile interface of a web site, if the business model or income is different from the regular web site. Also the new business itself could be unprofitable. Since developing and maintaining a mobile interface adds costs, it should add revenue too.

The situation reminds that which the newspaper industry faced earlier with the Internet. Stahl et al. (2004) described how reusing material from newspapers on Internet could result cannibalization of the printed version. Printed papers were available for a fee while online versions were usually free. The cannibalization was indicated by younger people not subscribing to newspapers but rather substituting them with information and news from web sites.

The strategy for the mobile site depends also on the actual web site. For example, if the regular web site would consist of pay-only content, it would not make sense to have free mobile site.

2.4.1 Models

Not much study has been done on the business models for mobile versions of web magazines. However, some more general models can be used for reference. Rappa (2000) lists the models that are available on the web to be brokerage (facilitate transactions), advertising (selling ads on content), infomediary (selling customer data), merchant (wholesalers and retailers), manufacturer (selling directly), affili-

ate (providing purchases for merchants), community (sale of ancillary products), subscription (user fees) and utility (fee for actual user usage).

These Internet business models can be applied to mobile Internet, as long as the unique characteristics of mobile environment are considered. The mobile browsing is not completely the same as normal Internet browsing. (Mannermaa, 2006) Some of the mentioned models are plausible for a web magazine. Mings and White (2000) describe the following four models, which correspond to the Rappa list:

- The Advertising Model
- The Subscription Model
- The Transactional Model
- The Bundled Model

The Subscription Model is familiar from newspapers. In most cases the model has been used in conjunction with the Advertising Model. Usually the subscription fees have amounted for from 20 to 30 per cent of the income. It is seen harder to maintain that share of subscription fees online, as a lot more competition exists and people are not that interested in paying for online content in first place. The Advertising Model can be used in form of site sponsorship, banner advertising or interactive advertising.

In the Transactional Model the web magazine can get revenue by facilitating transactions between its users and e-commerce companies. In the Bundled Model the newspaper establish partnerships with other entities, like Internet access providers, web browsers, Internet services or other content providers to generate revenue. These models are looked in more detail in the following sections.

2.4.2 The Advertising Model

Mobile Marketing Association (2009) lists banners ads, text ads and branded mobile web sites as the advertising opportunities in mobile web. They list the purposes of these advertisements to be mainly about driving users to mobile web sites, generating leads, direct sales and branding. Figure 9 shows the general operation of advertising model as Devine and Holmqvist (2001) describe it.

There are two main points to concern regarding advertising on mobile sites: First, how the advertising on mobile web sites affects the user experience on mobile Internet. The second point is how useful for the advertisers is the advertising on mobile web sites, both generally and compared to the regular web sites.

It is important to consider user's need when placing ads on mobile web site. Users often have immediate information needs and the advertisements should not disturb users by occupying too much of the small display size. (Rau et al., 2006) It is also good thing to keep in mind the limitations of the mobile connections. Users have to

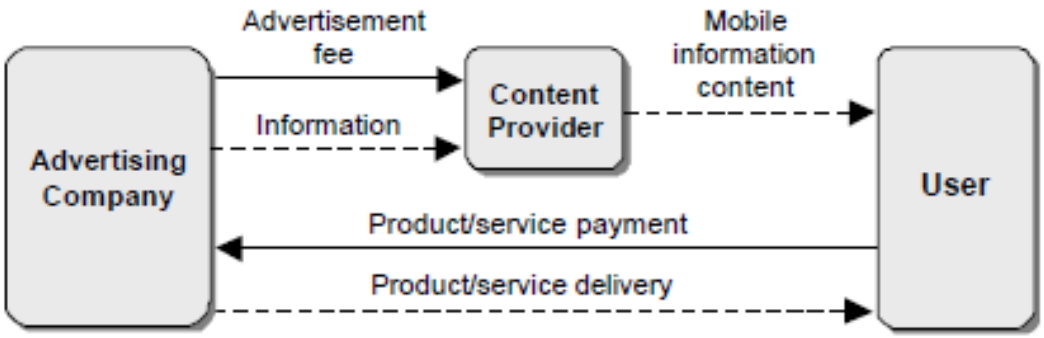

Figure 9: The advertisement model (Devine and Holmqvist, 2001)

download the data for the advertisements. Since the connection has limited speed, this might slow down the usage. Also if the user does not have a flat rate pricing, viewing the ads might actually cost the user money.

One challenge for advertising on mobile web is the lack of standards for the mobile devices. Some properties that vary are form factors, screen sizes and resolutions, which make it challenging to display the content and advertising optimally (Mobile Marketing Association, 2009). Since the smartphones look the same and could have the same resolutions, it could be possible for content providers to work with a few resolutions on the devices, if there were some standards to follow (Salim and Alikhani, 2009).

Targeting

One important factor in advertising is the targeting of the ads. Better targeting and better measurability have been considered to be the benefits of advertising on the web (Mings and White, 2000). On regular web advertisers are trying to find good sites to put their advertisements on. The content of the site must support the ads so that the users are interested in the products advertised and are willing to pay attention the to advertisements. With mobile web the targeting might be even more important.

Good example of targeting of web advertisements are the targeted ads in search engine results. The ad rates on targeted search results have been shown to be about double the ones of bulk ads on same sites by Shapiro and Varian (1999).

Advertisers might also want to stay away from mobile sites, if their campaign is based on getting users to their web site that has information on product or service, competition or other content. If there is no mobile version of this site a mobile user directed to the site might not fill the purpose. The purpose of mobile advertisement might be to present the information directly, because asking users to move to another page might be inconvenient in mobile use (Rau et al., 2006).

There are some examples of how mobile users can be seen as a targeted group of users. Users of the mobile devices represent demography in which people are enthusiastic about technology, likely to pay subscription fee and attractive to advertisers

(Thurman and Herbert, 2007). A Jaguar advertising campaign was targeted to user group from ages of 35 to 54 years old and income above 150.000 dollar per year and who used certain mobile web sites (Salim and Alikhani, 2009).

Another way to do advertising on mobile Internet is companies sponsoring different parts or the whole content. User might get an access code from the sponsoring company and the content provider gets a fee from the sponsoring company when the user access the content. (Devine and Holmqvist, 2001)

Actual revenue

An often used measurement for web advertising is the click through rate (CTR). The advertisers are often interested in the users clicking their banner and viewing their web site that is associated with the said banner. The CTR for a mobile user and mobile campaigns could be different from those of normal web users and campaigns. There are some examples of mobile web campaigns and their click through rates.

Salim and Alikhani (2009) present cases of Jaguar advertising a car and getting a 0.6 percent CTR and Snickers having a 2-3 percent CTR with their football penalty shot game banner. CTR on the mobile Internet has stabilized at 1-1.5 per cent, which is higher than on regular Internet and thus advertising companies are prepared to pay more for advertising on the mobile Internet (Devine and Holmqvist, 2001).

Still, the big question is whether advertising as a revenue source for mobile sites is working model. The picture is not encouraging at the moment. Even if the advertisers are ready to pay more, numbers of advertisers and users are not big enough to get a lot of revenue.

Most mobile extensions of Web 2.0 platforms do not provide additional financial income, as the advertisements are not shown on mobile versions. Mobile extensions are thus cost and profit neutral. (Martignoni and Stanoevska-Slabeva, 2007) The business is not seen as profitable at the moment, but rather as a business for future. For example, Swedish newspaper Aftonbladet does not cover the mobile development costs with mobile advertising revenues. (Salim and Alikhani, 2009)

2.4.3 The Subscription Model

Another major way to get revenue from a web site is through users fees. The fees could amount for all or part of the revenue of a mobile web site. The biggest question with user fees is whether users are ready to pay for the content.

The subscription model was successful with newspapers, but the move to Internet was not successful. Most of the web magazines or news sites use the advertising model, since users are not willing to pay for online news. Chyi (2005) studied the paying intent, or willingness to pay (WTP), of users. The conclusion was that users were not ready to pay for online news as free alternatives existed, both online and offline. The online news do not have unique value. This conclusion seems reasonable, since the news items are usually quite simple and necessarily similar in content. This means it is hard for the sites to differentiate from other options.

Since most of the content on the Internet is free of charge for users, many analysts have concluded that there would not be willingness to pay for content on mobile Internet either. However, Japan is used as an example where is assumption is not working and users are paying for content. This could be partly because Japanese have not been "spoiled" with free content on Internet, but another reason might be the low pricing and easiness of paying for the content. (Devine and Holmqvist, 2001)

Also, online newspapers in western world see more potential for charging for the mobile content. This is because mobile has always been a pay zone, unlike Internet. It is also believed that people with new devices such as PDAs are more enthusiastic about technology and more likely to pay for a subscription. (Thurman and Herbert, 2007)

In Online Publishers Association (2007) study the amount of mobile users who are paying for mobile content in Europe reached double digits. The categories users were most willing to pay were Sports News/Highlights/Scores (16 per cent), Technology News (14 per cent), Business/Financial News (14 per cent) and Weather (14 per cent).

There are some different ways to put a fee on the content. As mentioned earlier, content can be charged for either by per usage or by a fixed monthly subscription fee (Devine and Holmqvist, 2001). Companies might prefer fixed price that provides steady income, but competition might lead to use of a utility model, which might be more cost effective but also confusing for customers (Mannermaa, 2006).

Compared to a purely advertising based model, the uses fees raise a complicating issue: the fees have to be collected from the users. This is why the subscription model includes a billing party, as shown in Figure 10.

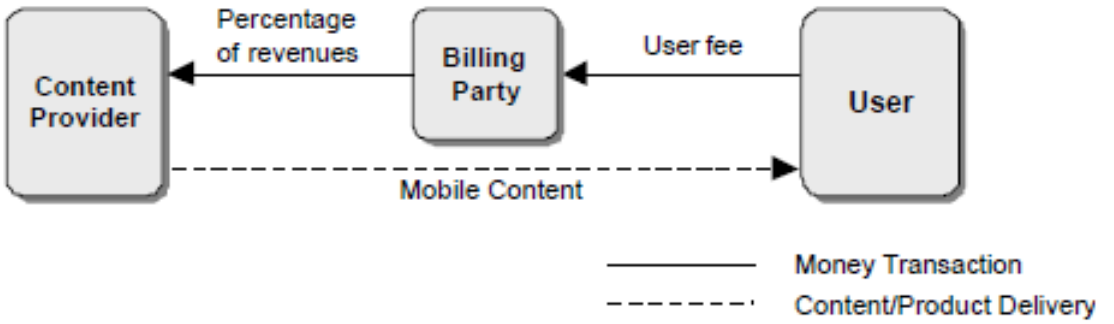

Figure 10: The user fee model (Devine and Holmqvist, 2001)

Since the fees talk about here are likely to be quite small, the concept of micropayments has been introduced. Micropayments have received a lot of attention during past years, but so far there has not been options for them widely available (Mensing and Rejfek, 2005).

On mobile devices SMS might be a way to handle payments. Existing billing interfaces are an advantage, but the market of premium short messages is fragmented,

since every operator has their own regulations. When credit card companies and device vendors introduce new technologies, the market for payments will likely change. (Mannermaa, 2006)

Some ways to handle the payments have been already introduced in Japan, where the mobile Internet and paid content has been in use. Devine and Holmqvist (2001) list The Clearinghouse Model and Quasi-clearinghouse Model, Pre-paid Cards and Credit Cards as options. In the Clearinghouse models the mobile content is billed in conjunction with some other billing for the same user, like the mobile Internet bill from the connection provider. In these cases the biller gets a commission of the content fee. The Pre-paid Cards are bought before accessing content. They contain a unique identification number, which user enters when using the content. Credit cards are arguably more self-evident payment method. Their problem with mobile use has been the lacking security of the mobile browser technology.

2.4.4 Transactional Model

In the transactional model, the content providers get their income from initiating transactions of (supplemental) content on the site. There are different kinds of content offered to users to buy and download to their mobile devices. These include applications, music and other audio. The Transactional Model could be useful when these products would be offered to the users.

The affiliate model is inherently well-suited to the web and can come in form of different variations such as banner exchange, pay-per-click and pay-per-sale (Mannermaa, 2006). On the mobile web, the increasing number of users and improving mobile technology positions content providers to take advantage of e-commerce opportunities and exchanges (Sylvie and Austin, 2008).

2.4.5 Bundled Model

In the bundled model, the content of the content provider is sold or provided bundled to some other material. The Bundled Model could mean for example providing the content to the portal sites of network operators, which many of the users use as starting point in surfing. What Devine and Holmqvist (2001) call as "Revenue sharing model" is illustrated in Figure 11

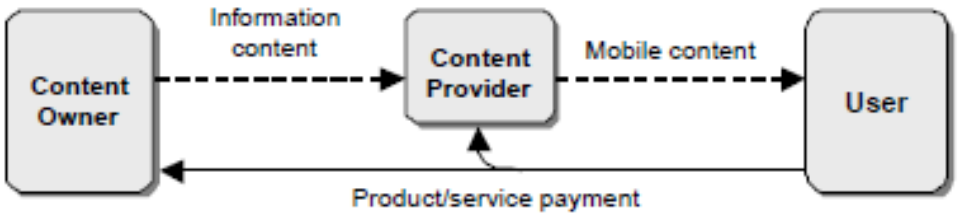

Figure 11: The revenue sharing model (Devine and Holmqvist, 2001)

Sylvie and Austin (2008) says that if newspapers are to make money, they need to make their content available for mobile providers for a percentage of revenues. This would also create strategic alliance, which helps the content provider to dispense their content to user in another vehicle. Depending on the specific content, the content owners might also pay for providers to expose the content. In those cases the revenues are also shared according to agreed principles (Devine and Holmqvist, 2001).

2.4.6 Brand building

There are some examples of mobile sites that can be used to see some of the revenue models that are in use. All of the mobile Internet site versions in both the visitor statistics listings of Section 2.3.3 are free for the users to use. Only Swedish Aftonbladet had any advertisements on the site. Finnish Sanoma Corporation sites (Helsingin Sanomat, Iltasanomat etc) and Alma Media (Iltalehti, Kauppalehti etc.) have advertising space and banners that currently link to different mobile sites of the same corporation. Since YLE is a public broadcasting company, its sites do not show up in the visitor statistics list that are mainly kept for advertising purposes. Obviously there are not any advertisements on their sites, and no need for them either.

Fetscherin and Knolmayer (2004) identified the five components a content industry business model should include: product, consumer, revenue, pricing and delivery. These authors use the newspaper and magazine industry to test the effectiveness of their components on profitability and show the importance of a good selection of free content and content offered at cost, as well as the importance of online content as a complement to or substitute for the physical product.

Autosport is a good example of good selection: their regular web site include news and some articles for free, but users who pay subscription free get more detailed articles and the mobile version of the regular site. They also have multiple options for users to pay for the material on the regular site. Access can be bought for single articles instead of subscribing. Another non-Finnish example of a mobile site is the ESPN site mentioned as one of the most accessed sites in Finland in Section 2.3.3. This site does not have ads either, but is part of the brand of the ESPN TV-channel.

These examples show, that a mobile interface can be build without direct financial benefits that would produce profit or even cover the costs. A mobile interface can be seen as something that is maybe profitable in future, but needed already or as something that strengthens the brand and drives the users to the regular web site or some other media. Devine and Holmqvist (2001) recognize this operation as The Marketing Core Business Model, which is illustrated in Figure 12.

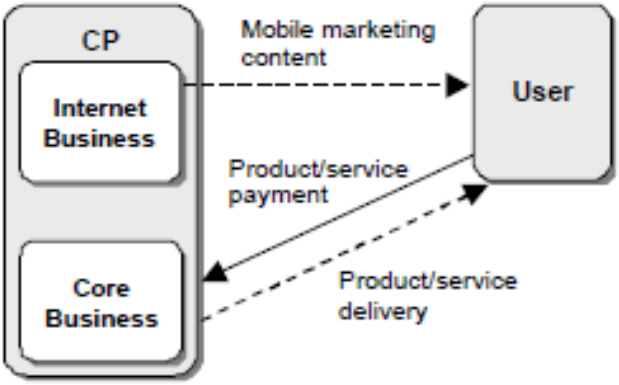

Figure 12: The marketing core business model (Devine and Holmqvist, 2001)

2.4.7 Summary

In this section the revenues of a mobile site were discussed. Some models to use were identified. The advertising model and the subscription model were the most well know and used ones. Next some of the methods that will be used in this thesis are looked into.

2.5 Methods

In this section, some of the methods used in this thesis are looked into. These include using different usage statistics, user questionnaires and doing financial modeling.

2.5.1 Usage statistics

Different kind of usage statistics can be used as a source material for study. In this thesis, three different kind of statistics are used either directly or are referenced. These are public listings of web site visitor amounts, more detailed visitor analysis of a particular site and usage based measurements.

The public visitor lists some companies offer are built for sites to reliably measure visitor amounts. The main purpose is to help selling advertising. The advertisers are obviously interested in reliable third party information which is presented in such way that different sites can also be compared. This can be done when the sites exists in the same listing. Different listings might use slightly different methods and thus have different numbers even for same site.

Some things that the listings list are unique visitors, total visits and overall page loads. Unique visitors means the different people (or devices) that have accessed the site, total visits are the total session users have accessed the site on and the page loads is the overall number of individual pages all the users have loaded. The most used time frame for all these numbers in per week. The listings can include

also mobile sites. Participating on the listings might cost money for the sites listed. Thus the lists contain far from all the sites. This is especially true for the mobile listings.

Another version of statistics that can be used to describe a particular case are the analysis tools. A particular example used in this theses is Google Analytics (Google). The analysis tools give the same overall information as the visitor listings, but since they are targeted for the site owner's own usage, a lot more data is analyzed. The site owners gets information on their users, for example the number of pages average user views, the time they spend on the site and the platforms their device uses.

Usage data can also be collected from networks or handsets. Network based data collection can provide accurate aggregate measures of usage, such as data transfer, but no knowledge of the applications being used. On the other hand, handset based measurements are objective and accurate and provide detailed data. They require users to participate into the measurements. (Verkasalo and Hämmäinen, 2007)

2.5.2 Questionnaires

Questionnaires are a type of survey that consists of series of questions that often have standardized answers. Internet surveys are cheap and fast to carry out for the questioning party. They are also convenient and provide anonymity for the respondents, all which mean they have high response rates. (Cheyne and Ritter, 2001) It seems particularly good idea to use an online survey when the questions are about an Internet usage.

There are some things to take into consideration when conducting a questionnaire. First, because people are answering the questions, the answers are subjective. Further more, it is not automatic that the results of the survey can be generalized to a larger population (Dillman et al., 2001).

It is important to try to get the people who answer to questionnaire to be representative of the whole population surveyed. The people who answer the questionnaire should be qualitatively representative, for example come from demographies that correspond to the who population. Also the number of people who answer the questionnaire should be quantitatively large enough.

A confidence interval, or margin of error, can be calculated for the distribution of variable when the population size and the sample size are known. Confidence level is associated with the confidence interval: for example it could be 95 percent certain that the true answer lies within the confidence interval.

2.5.3 Financial modeling

Building an abstract model of a financial decision making situation is called financial modeling. Usually such model includes the costs and the income associated with different options. Since these can occur over several years, discounted cash flows are

used.

Benninga and Czaczkes (2000) describe some basic concepts in financial calculations. Net present value (NPV) describes the present value of anticipated future cash flows. When considering an investment, the investment's return is compared to a bechmark return. Thus the cash flows in future years are discounted using opportunity cost as a discount rate. NPV can be calculated with equation

$$NPV = CF_0 + \sum_{t=1}^{N} \frac{CF_t}{(1+r)^t}$$

where CF0 is the initial cost of the investment and CFt the income of each year.

Internal rate of return (IRR) is defined as the rate of return that makes the NPV equal to zero, as in

$$CF_0 + \sum_{t=1}^{N} \frac{CF_t}{(1+r)^t} = 0$$

However, spreadsheet is as good as its assumptions. Once organization operates, assumptions and the model is tested. (Magretta, 2002) There are some ways to make the models and calculations more useful. Since most of the inputs to the models are uncertain Hämmäinen (2010) categorized the following to ways the uncertainty can be coped with:

- *Sensitivity analysis:* considers the effects of changes in key assumptions only one at a time.
- *Scenario analysis:* many or all of the variables are changed simultaneously, enabling different what-if and worst/best case scenarios to be analyzed.
- *Simulation analysis:* probability distributions specified for the variables, Monte Carlo simulation used to generate thousands of different scenarios.

The selection of the method used to cope with the uncertainty depends on the complexity of the financial model and the intended accuracy of the estimations. More throughout analysis give more detailed results.

2.6 Summary

In this chapter, the mobile Internet domain was examined from view points of mobile business and business models, mobile browsing experience and mobile interface revenue models. This section is used as a background for next chapter, which discusses the particular case this thesis covers.

3 Jatkoaika Case

In this is chapter the Jatkoaika case in looked in more detail. The motivation for the mobile interface project is presented in Section 3.1. The user questionnaire and its results are shown in Section 3.2 and the solutions to evaluate are introduced and evaluated using the STOF approach in Section 3.3. Financial models are developed and estimations calculated in Section 3.4.

3.1 Case details

The site is a sports related site with news, articles, match reports and other topical content. The site averages about 150 000 to 180 000 unique visitors per week (Suomimedia). This makes the site approximately top-50 site in Finland. Direct comparisons to other sites are not completely accurate as the visitor numbers change from week to week and the other measurement listings use a little different methods.

The current business model for the site is based fully on advertising income. The advertising consist mostly of individually sold campaigns. If another model would be used for the mobile interface, the model for the whole site might have to be considered again too.

There are several factors in this the case of this site, that show a demand for mobile interface and thus motivate for mobile interface development:

- Kuuluvainen (2008) conducted a user questionnaire in 2008. The user profiling done back then is mostly likely accurate even a couple of year later. Overall, 91 per cent of the users are men. The age group of 20 to 30 years is the biggest group of users. Since young people are more active packet data users than old people, especially in browsing and the age group of 25-44 year-olds is clearly most active group of data users (Kivi, 2005), it would be likely, that the users of this site would use a the site with mobile phone.

- The current web site can be seen in Figure 13. The structure of the site is quite simple and thus probably usable with mobile devices. However, there are plans to build a new web site in the near future. The new site would use more of the features today's techniques allow web sites to have. This would mean that the new site would be less usable with a mobile device.

- Recently clearly large banners with a size of 980x400 pixels have become preferred for many advertisers. These banners are some times felt to be big enough to annoy some users, but on the other hand they are easier to recognize than smaller banners. However, those banners are clearly even more annoying for mobile users. The biggest banners recommended for mobile interfaces are either 300x50 or 300x75 pixels in size, depending on aspect ratio (Mobile Marketing Association, 2011).

Figure 13: Jatkoaika main page March 2011.

- Currently no mobile version of the site is available for the users. However, in the 2008 questionnaire 16.5 percent of the users used the site with a mobile phone sometimes and another 4 percent even frequently (Kuuluvainen, 2008).
- The amount of mobile visits on the current site has clearly increased during the last year. Figure 14 shows the ratio of mobile visits to all visits from April 2010 to March 2011, monitored by Google Analytics (Google). The usage of the site is seasonal, but same trend of the mobile usage ratio continues through early 2010 and late 2009 regardless of the seasonal changes. The seasonal changes are shown normalized in Figure 15 for the same time period as in Figure 14. The 4 percent mobile usage ratio the site had in early 2011 is the same as some mobile interfaces had in Table 4.

3.1.1 Mobile usage

The visitor profiles of regular users and mobile users are quite similar. Average user views 2.82 pages per visit and spends 4.00 minutes on the site, while the average

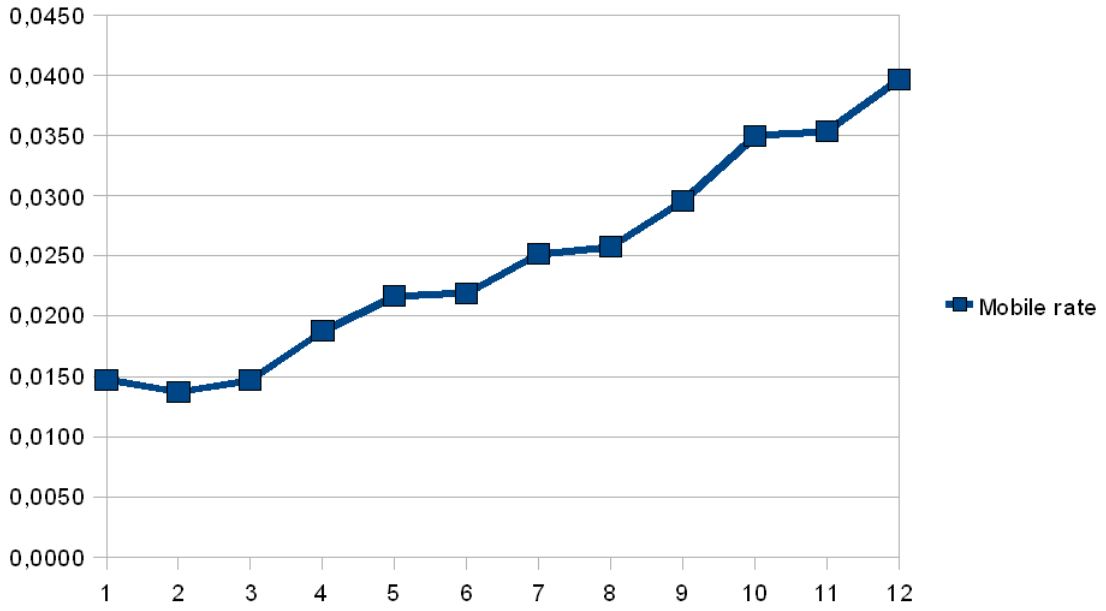

Figure 14: Rate of mobile users

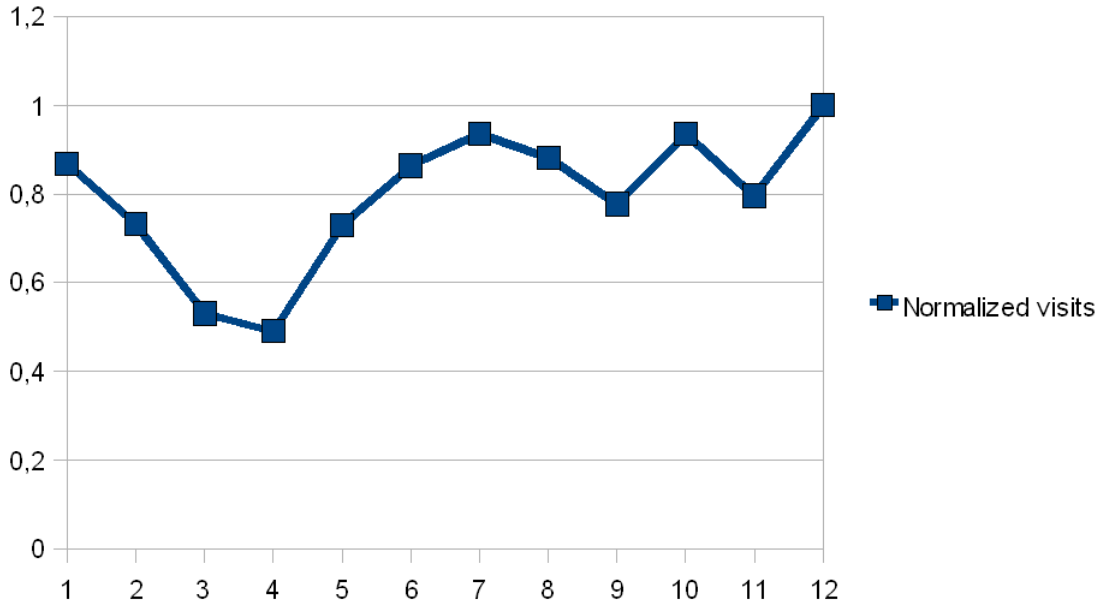

Figure 15: Normalized overall visits

mobile user views 2.31 pages and spends 4.14 minutes on the site. The longer time for mobile users could result from slower data transfer and navigation.

Bounce rate meters the users who leave the site after viewing just use page. The rate is 43.88 percent for regular users and 43.99 for mobile users. This seems to indicate that many visits are from users checking the front page for news or articles

and leaving if they do not see something that interests them. Again, this use seems to be the same for mobile users and regular users.

The mobile usage in the Google Analytics statistics is divided quite evenly with three leading platforms. Symbian OS is used for 33 percent of the visits, iPhone for 28 percent and Android for 26 percent of the visits in March 2011. Increasing number of the mobile visits come from iPad, which is used for 9 percent for the visits.

The several platforms the mobile users use gives a reason why only browser based service is considered in this work. Considering a downloadable application was not deemed to be in the scope of the work in Section 2.2.1. This is even though such an application might be more on a "pay-zone" than a mobile interfaces and thus maybe financially beneficial. Since the users are divided so equally among three different platforms, there would be a need to develop three versions of any application that might be planned. That task woudl be quite large.

3.2 User questionnaire

A questionnaire for the site users was conduced to get more detailed knowledge on the particular case. The questionnaire was conducted on the web site on April 2011 and had n of 304. The full results of the questionnaire can be seen in Table 5.

The sample size is fairly large. If the amount of weekly mobile users on the site is considered to be around four percent of the 150 000 to 180 000 visitors the site averages, there would be around 6000 to 7000 weekly mobile users. If population size of 6000 would be used, confidence interval of 5.48 is reached with the sample size and 95 percent confidence level.

Users were most likely answering to the questionnaire on their computer, as it is more convenient than using a mobile device. This is probably not a problem, since it is unlikely that many people would be using the site only with a mobile device and would not answer the questionnaire at all.

The questions were designed based on things discussed on previous chapters. The idea was either to confirm that the findings in referenced studies apply also in this case or to find out more detailed information relevant to this case. Next the key findings of the questionnaire are looked into.

3.2.1 Characteristics of Mobile Usage

The mobile users seems to be using mobile Internet a lot: 87.5 percent answered that they use mobile Internet often and 10.5 percent sometimes. On the other hand, Jatkoaika was used quite often too, with 59.9 percent using it often and 29.6 percent sometimes.

The people who decided to answer to the questionnaire could be more interested in mobile browsing than those mobile users who did not answer the questionnaire.

Thus the number of people who say they use mobile Internet often is high. It also seems reasonable, that the people either use mobile Internet often or do not use it at all.

Most of the people (58.6 percent) did not differentiate their mobile usage from their usage of Internet on the computer. Just browsing to kill time was maybe even surprisingly popular answer with 20.4 percent share, which is almost as much as the 21.1 percent for information search.

3.2.2 Mobile Interface Preferences

It seems that the mobile tailored version of interface is the preference among the mobile users. 60.5 percent of the users answered that they prefer to use the tailored interfaces, while 27.0 percent either use only regular interfaces or prefer them. Quite a few people did not have a preference: 11.8 percent of the users did not answer the question.

When the people who did not answer the question are removed, 70 percent of the users seem to prefer or use mobile tailored interfaces and 30 percent prefer the regular interface. Only a couple of people answered that they use only the tailored interfaces. These people consistently answered that they did not use Jatkoaika site on a mobile device.

3.2.3 Paysite Opinions

The users were questioned on their willingness to pay for a mobile interface. Only 4.6 percent of the users answered that they would pay for a mobile interface, but 34.9 percent answered that they could maybe do that. Majority of users (54.6 percent) would not pay for a mobile interface. The high number of people who said they might pay could be affected by the fact that no price was mentioned. People would most likely be more willing to pay a small fee than a bigger fee.

It would have to be estimated how many of the people who answered they could pay for content actually would pay for it. If that number would be 25 percent, overall of the people who answer the question 14 percent would pay for the interface.

3.2.4 Mobile Commerce

Quite a few people seemed to have bought something on the mobile Internet. Overall, 27 percent of the users had bought something and while another 27 percent had yet to buy, they though they might do that. Based on those numbers it would seem that a transactional model could be possible. However, it is unclear how often these people have bought something. More information would be needed to make accurate calculations.

3.2.5 Usage

Overall the findings on the questionnaire are quite clear on many fronts. These findings will be used on subsequent sections when the financial calculations are performed and in next section where ways to build an interface are discussed.

Table 5: User questionnaire

Question	Option	%
Age	15-24	32.9
	25-41	63.8
	42-	3.3
How often do you use mobile Internet?	Often	87.5
	Some times	10.5
	Rarely	2.0
How often do you use Jatkoaika on mobile Internet?	Often	57.9
	Some times	29.6
	Rarely	9.9
	Never	2.6
What do you mainly use mobile Internet for?	For information needs	21.1
	Browsing to kill time	20.4
	Just like regular Internet	58.6
Do you prefer regular web or tailored interfaces on mobile Internet?	Use only full web	5.9
	Prefer regular interfaces	21.1
	Prefer tailored interfaces	60.5
	Use only tailored interfaces	0.7
	No opinion	11.8
Have you bought any products through mobile Internet?	Yes	27.0
	No, but might	27.0
	No	45.4
	No opinion	0.7
Would you pay for content on mobile Internet?	Yes	4.6
	Maybe	34.9
	No	54.6
	No opinion	5.9

3.3 Models for the interface

Based on the findings on the characteristics of mobile usage in section 2.2 and the details of the case, there could be three different ways to provide the site for the users.

- No mobile interface
- Simple mobile tailored interface
- Mobile friendly fuller interface

The first solution for the problem is not to build a mobile interface at all. This might be a valid option, since reasonably many users use the site with a mobile device even without the mobile version. The mobile tailored interfaces might not generate enough revenue to cover the investment. This might be because users would use the regular interface on mobile devices anyway or there might just not be enough user interest in a mobile interface.

The second solution would be to make a tailored mobile interface that has only limited amount of the content that the normal web site has. This solution would be in line with the other popular Finnish sites introduced in Section 2.3. Technically this solutions would seem to be pretty straight forward to design.

The third solution would be to make a modified version of the regular site for mobile use. In this solution, the regular site would be transformed in to a mobile version by making necessary changes page per page. This way the mobile interface would contain all the information of the regular site, but would be more usable with a mobile device.

The other angle to look the situation from is the used revenue model. Of the models discussed in Section 2.4, the advertising model and subscription model can be considered to be valid to be the revenue model for the mobile interface. The advertising model is the model that is currently used on the regular site, so extending that to the mobile interface seems like a reasonable idea. On the other hand, based on the user questionnaire there seems to be some interest to pay a subscription fee. That means using the subscription model have to be looked into too.

The transactional model could also be viable. Based on the questionnaire, the users do commit transactions on mobile Internet. For the purposes of the financial calculations it does not differ from the advertising model too much. The ads can be thought to be replaced by advertising of products or services the users can purchase online. The bundled model could be a viable model, but is outside the scope of the project. The plan is to see whether building a mobile interface for the web magazine itself if viable.

Next the proposed solutions are looked in more detail. This is done by using the critical success factors and design issues of the STOF model's four domains, as mentioned in Section 2.1.3.

3.3.1 Service

In the STOF Service domain, the Critical Success Factors are (1) Clearly Defined Target Group, (2) Compelling Value Proposition and (3) Unobtrusive Customer Retention, which are mostly covered with the Critical Design Issues of Targeting, Creating Value Elements, Branding and Customer Retention.

The target group of the mobile interface is quite clearly defined. Mostly the users would be the current users of the site and more clearly a subsection that uses mobile Internet. Those users can be either users who use the current full site with mobile device or users who would use the mobile interface, if it existed. The users would either want to get information even when they have access only with a mobile device or are surfing with the mobile device for hedonistic purposes.

Supposedly there must be value for the users who use already use the regular interface with a mobile device. On the other hand, those who might be potential mobile users, but do not want to use the regular interface might prefer other kind of value elements. If it is possible to provide value for both types of users, the new interface can be targeted to both the groups. Otherwise there would have to be some choices made in choosing the target group. More reasonable way would be to target the users who do not use the regular interface with mobile device. Those users who use the regular interface do that already have a service that provides them value.

Since the users would be mostly the users of the regular site, the branding and marketing would be quite simple to handle through the regular site. Also, detecting mobile users on the regular site would help. The new mobile interface could be especially mentioned to those users when they enter the site.

Customer retention depends on the revenue model. If the is no user fee, retaining users means mostly creating compelling value proposition for the users. If a model with user fees in used, the way the users pay for the content can affect customer retention. Users would most likely prefer paying subscription fees for shorter length. This way users could decide to change their preferred site more easily, as there would not be big cost of moving their business to another content provider.

3.3.2 Technological

The critical success factor on Technological domain is to reach Acceptable Quality of Service. Quality of service is also a CDI on technology domain. The quality of service is apparently acceptable for the users who currently use the site with a mobile device. This level would have to be at least maintained and probably improved to get users to switch to the new interface. The quality of service would have to increase for those mobile users who are yet to use the site with mobile device.

The CDI of Accessibility for Customers is quite important in this case. One could argue that the whole point of building a mobile interface is to increase the accessibility of the service compared to having no mobile interface. Thus the design choices and the selection of the solution type (stripped interface or fuller interface) is vital.

The CDI of System Integration is topical in this case. Since the web magazine already exists, a publishing system with certain database, administration interface and lots of data on the system also exists. More specifically, the various types of articles on the site are not just plain text, but include quotes boxes, linked box stories, pictures as part of the article. Article types also include photo reportages.

The amount of integration would depend on the solution. For the stripped interface there would be more to work to do integrating the existing material. The actual design work to build the needed sections would be bigger for the more fuller version, since that version would contain more pages.

Otherwise the technical aspects of actually running a mobile interface do not differ much from running the regular site. The server hardware, software and the network connections that are needed already exists for the current implementation. As a result, when estimating the amount of work and investment needed for building the mobile interface, mostly the work to design and build the site and integrate the material need to be considered.

3.3.3 Organizational

The critical success factors for creating network value on the organizational domain are (1) Sustainable Network Strategy and (2) Acceptable Division of Roles.

The CDI of partner selection is affected by the need of partners. The selected revenue model affects the partners needed. In the case of advertising revenue, advertisers are needed. Advertisers can be seen either as customers, but also as partners, if they are long term advertisers. Also needed is an advertising agency that handles the selling of advertising space and some of the technical issues, like tracking the CTR of the campaigns and so on. In the case of user fees there needs to be the billing party, that handles getting the money from the user. If both ways are used simultaneously, both partners are needed.

The CDIs of network openness and governance would have to be considered. In this case the content provider would be the dominant actor. It would be quite important to make deals so that they do not exclude other actors joining the network on later time. For example, advertising agencies and the billing party should not have exclusive rights to act in the network without good return for the privilege.

One important point on the organizational level is to not only consider the technical and financial capabilities and resources of the organization. The resources of the people who actually provide the content for the site must be considered. In the case of a web magazine those people are the editors. It is crucial that they know what they have to do and have resource to do it. They must maintain their motivation even when a mobile interface is implemented. Having different ways to publish the material on the cite might cause the editors to have to learn to use some new components to present some of the material. If the publishing system is not smart enough, there might be even need to administrate some of the material separately for the regular and the mobile interfaces.

3.3.4 Financial

The critical success factors for creating network value on the financial domain are (1) Acceptable Profitability, (2) Acceptable Risks.

The amount of risk is mostly about losing the initial investment. This could happen in a couple of ways. First, either users might not want to use the mobile interface in first place. The technology could also change so fast that the interface could become obsolete fast. In these cases the investment would not yield revenue. The other possibility is that the users use the site, but introducing the mobile interface does not generate enough revenue to pay for its' upkeep. The mobile version might also lower the use of the regular site and decreases revenue. There might also be risk in not trying to improve the situation for mobile users. Those users might end up using different sites for regular use.

The CDIs that are relevant to the case and affect profitability are pricing and division of costs and revenues. Division of the investments is not relevant, as there are realistically no other investing parties in any of the proposed solutions.

The financial domain in explored more in next section, where models and calculations are used to see how financial domain could work in practice.

3.4 Financial estimations

In this section, the viability of finances for mobile web interface are taking a closer look into. The mobile traffic on the site is modeled and estimated in Section 3.4.1 and a financial modeling is done for the revenues and the income of the interface in Sections 3.4.3, 3.4.4 and 3.4.5. The models estimate the actual value of the projects based on the proposed mobile interface solutions.

The financial model tries to include all the different things working on the financial domain. The STOF view of financial domain is illustrated in Figure 16. Based on the parts of the domain, a model can be build. To make the models more usable, sensitivity analysis described in 2.5.3 are applied to the models.

In this case the revenues can be either advertising income or user fees. Advertising could be had on a fee based interface, so in practice the options are either advertising income or advertising income and a user fee. The costs are the initial design costs and then the increased costs of maintenance of the site.

Since technology is advancing quite fast, it is likely that an interface designed now would not be used for a long time. When making the calculations, it could be reasonable to expected the interface to be used for some years. Thus, the present value of the project is calculated based on the expenses and income of the next three years only. A discounting percentage of 5 is used to calculate the present value for the subsequent years. Also, the model does not take into account any taxes.

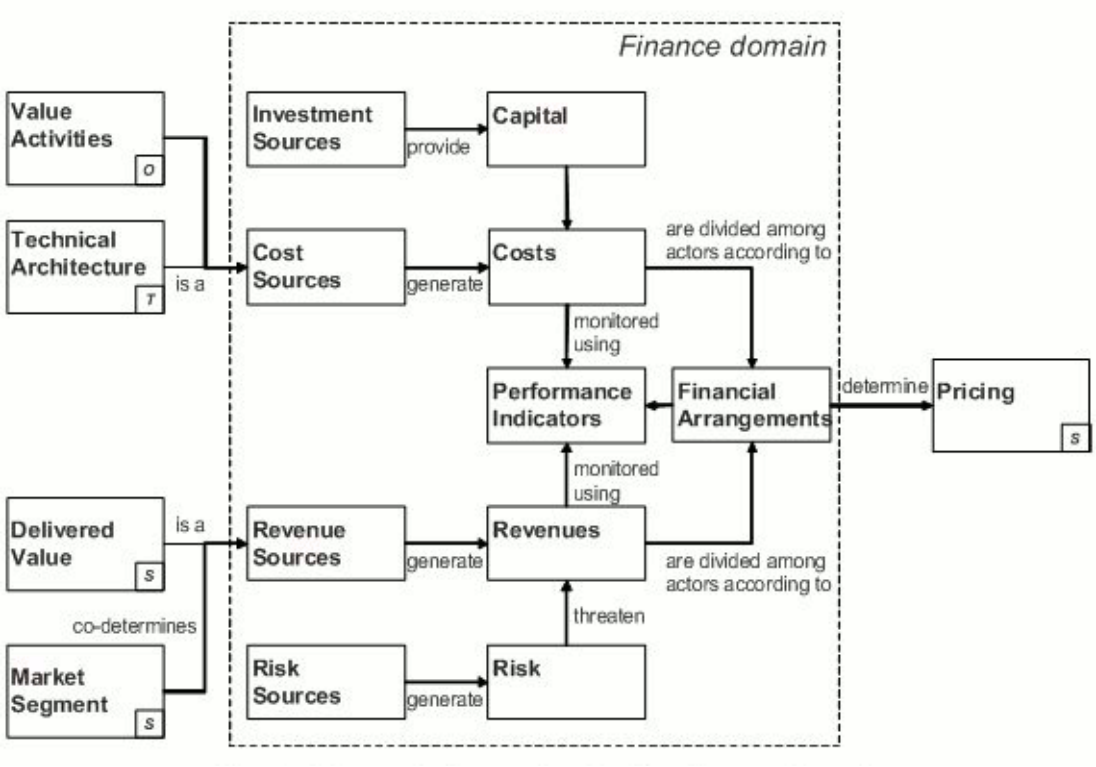

Figure 16: STOF Financial domain (Bouwman et al., 2008a)

3.4.1 Traffic estimation

The traffic on the mobile interface can be estimated based on the current mobile traffic on the site. Some mobile users prefer the regular interface even on mobile device. If a mobile interface is developed, not all the mobile users of the regular interface would switch to the mobile interface. However, some users will not use the regular interface with a mobile device, but would use the mobile interface, if there was one.

The equation for the mobile interface traffic (MIT) can thus be written as

$$MIT = nMT + x * MT \tag{1}$$

where nMT is the new mobile traffic, MT is the mobile traffic and x the percentage of the mobile traffic that will switch to the mobile interface.

To estimate x and nMT, the user questionnaire answers presented in Section 3.2 and the statistics of full and tailored mobile usage presented in Section 2.2.6 can be used. Both of the sources result similar estimations.

In the questionnaire, 70 percent of the users seemed to use or prefer tailored interfaces while 30 percent used or preferred the regular interfaces. Similarly, in the other reference 14 percent of user used only regular interfaces with mobile device and 32 percent used only tailored versions. If that ratio of usage choice applies also

to the people who can use both versions, 30 percent would prefer regular interfaces and 70 percent the tailored version.

Since the split of 70 percent to 30 percent seems like a good estimation, it can be used to calculate the number of users who would move from the regular interface to the new mobile tailored interface. Thus x in Equation 1 is 0.70.

Then, nMT would have to be estimated. Since people seem to prefer the mobile tailored interface quite heavily, it is reasonable to expect them to use it more often too. A basic estimation of those users increasing their usage 50 percent is used. Thus nMT would be 0.7 * 0.5 = 0.35.

When both these calculations are combined, MST is 1.05 (0.7 + 0.35) times MT. These calculations would thus mean that the amount of the traffic on the new mobile interface would be pretty much the same as the mobile traffic on the regular interface.

Also, the increasing rate of mobile users would have to be considered. During the last year, the rate of mobile users has increased from 1.5 percent to 4 percent. How ever, similar increase is not likely: the mobile users will not make up 16 percent of visit a year from now. More modest increase can be expected in the future. Basic estimation of 25 percent increase per year is used.

3.4.2 Advertising income estimation

The advertising income of a mobile interface depends on the fee the advertiser is willing to pay. That usually dependent on the traffic on mobile interface, user click through rate and how valuable a click or banner view is for the advertiser. This is based on how well the user of the mobile interface is targeted for the advertiser.

The advertisers can pay for either clicks on their banner or fixed fee for just showing the ads. However, even if a the fee is fixed, the value of the ad is usually calculated based on the amount of clicks. This means that the income can be estimated with the click through rate. Based on section 2.4.2 the mobile click through rate seems to be a little higher than on the regular web. Also, the mobile users are a little bit better targeted group, which might increase the value. On the other hand there might not be enough demand to have ads on the mobile interface all the time, which lowers the mobile value.

The advertising income can be calculated in relation to the current advertising income of the site, with the equation

$$MAI = AI * (MST/RST) * MV \tag{2}$$

where RST is the regular site traffic, MAI is the mobile advertising income and MV the mobile visit factor, which describes how valuable a mobile user is compared to a regular user.

In section 3.1 the current mobile traffic of the site is 4 percent of the regular traffic. If MST is calculated to be 1.05 MT, then MAI would be AI * 0.042 * MV.

Similarly, the advertising income on the regular site would get smaller because of the traffic decreasing. This decrease can be calculated as

$$deltaAI = -1 * AI * x * MT/RST \tag{3}$$

3.4.3 Calculations

The net present value of the project is calculated for the selected three year period by with first combining Equations 2 and 3 to get year increase of income and using the selected discount rate of 5 percent for years two and three. The values used for the calculations are moving mobile traffic (xMT) 0.70, new mobile traffic (NMT) 0.35, mobile rate multiplier for subsequent years 1.25 and mobile value (MV) 1.20. The current yearly advertising income of the site is taken to be 100 000 euros.

To get a better idea of how these estimations of the values affect the value, sensitivity analysis are used. Each of the parameter is changed separately from 80 percent value to 120 percent value while the other parameters stay the same. This way there are four different series of possible values, that are illustrated in Figures 17 and 18.

The nominal present value in 10 685 euro, while the worst and best cases vary from 6725 to 15 245 euro, depending on which parameter is changed, as shown in Table 6. The amount of new mobile users seems to affect the value a little bit more than the amount of moving mobile users. The latter already generate income in the case of no mobile interface.

Table 6: Estimated project values

Parameter	Low	High
Moving mobile users	9821	11549
New mobile users	9412	11958
Mobile user value	6866	14503
Mobile traffic increase	6725	15245

3.4.4 User fees

If the subscription fee model is used, the traffic estimations changes. Now some people still prefer the mobile tailored interface, but only some part of that group is willing to pay for it. In this case, the mobile traffic can be

$$MST = (nMT + x * MT) * z \tag{4}$$

where z is the amount of mobile users who would prefer mobile tailored interface and would be willing to pay for it. In Section 2.4.3 around 15 percent of mobile users in Europe would be willing to pay for the service, with 16 percent for sport content being the highest number. The results from the user questionnaire in Section 3.2

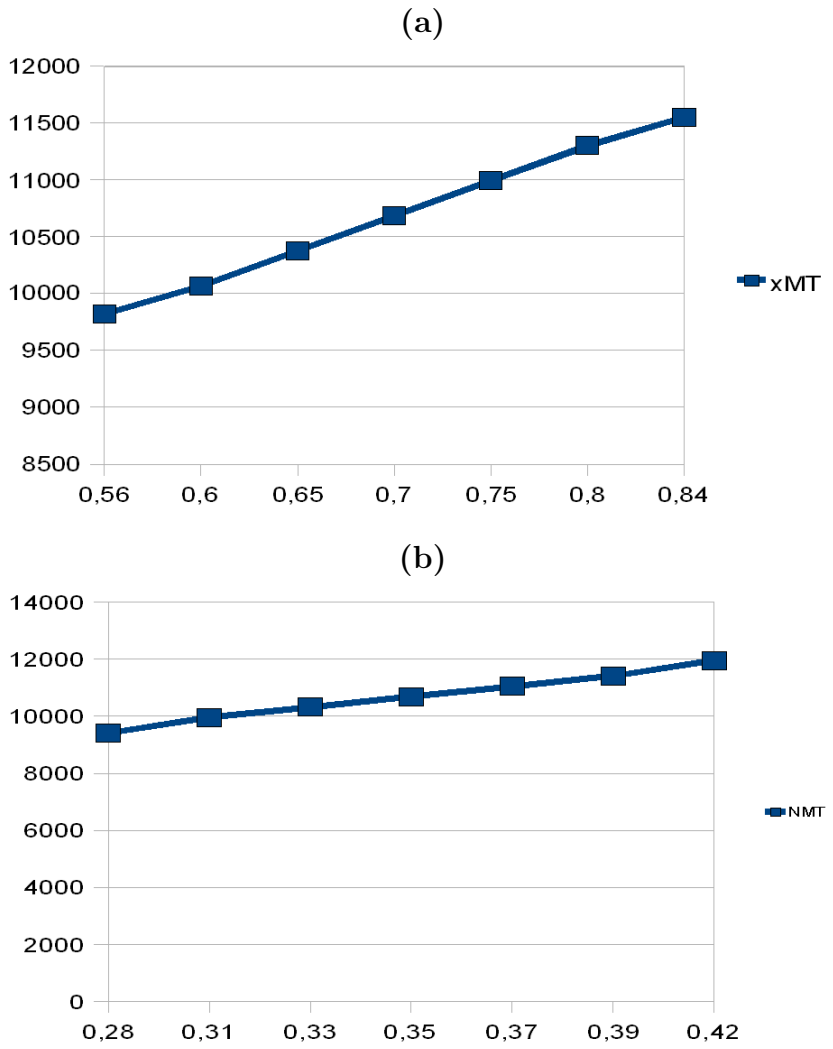

Figure 17: Sensitivities **(a)** Moving mobile users, **(b)** New mobile users.

would point to similar numbers. If z of 0.15 is used, MST would be 0.16 (1.05 times 0.15). Now the advertising income would be calculated with this value.

When the advertising income has been calculated, it is possible to calculate how much a single user would have to pay per year as a subscription fee to match the income of the free mobile interface. With 16 percent of mobile users willing to pay for the interface, that would be just 2.6 euro per year. How ever, 16 percent of mobile users being willing to pay for the interface seems quite high. Figure 19 shows the amount of money needed per year for different percentage of mobile users willing to pay for the interface. It is also important to notice that the money mentioned is not the same as the user price. Part of the user price goes to the billing party as a provision.

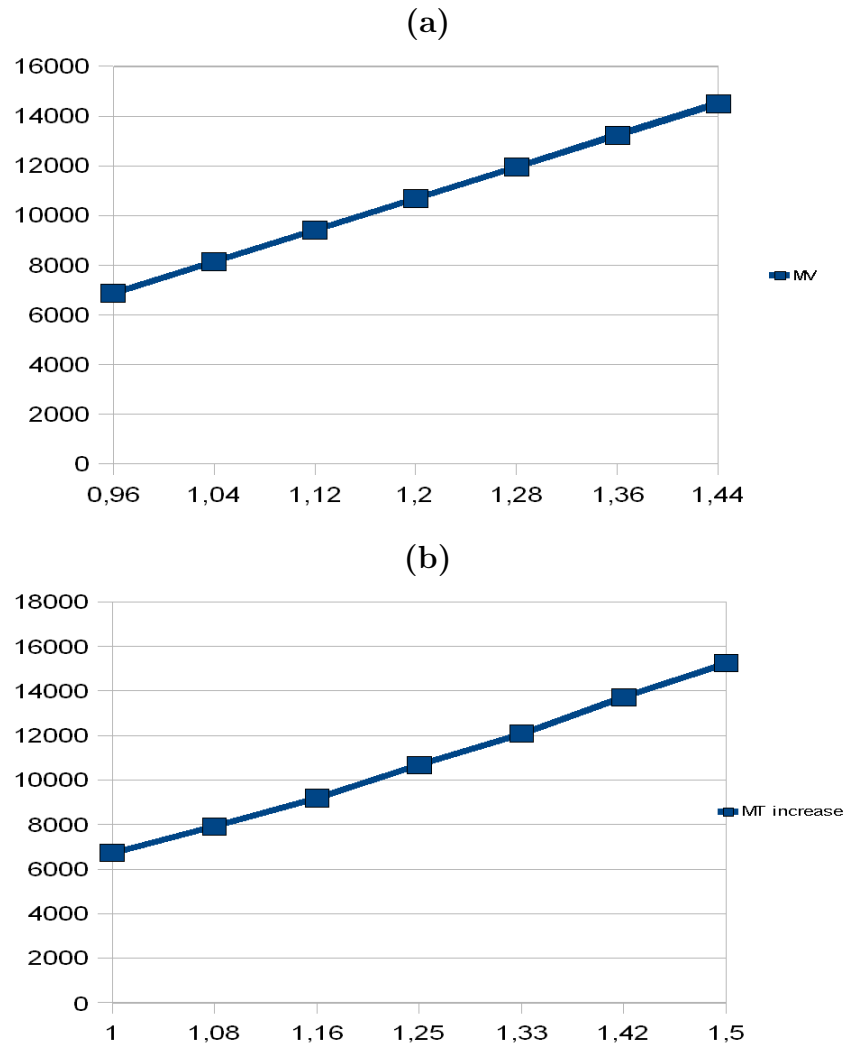

Figure 18: Sensitivities **(a)** Mobile user value, **(b)** Mobile traffic increase.

3.4.5 Transactions

If the transactional model would be used, the calculation for the average commision each user would have to genera would be quite easy. In this case, the advertising income would be stituted for income from the transactions.

The value each mobile user would have to bring to reach the income of the advertising model can be calculated with equation

$$Value = MAI/MIU \tag{5}$$

where MIU is mobile interface users, which is calculated by multiplying the estimation 150 000 with number of mobile users 0.04.

When the number of mobile users is increased with the multiplier of 1.25 for the subsequent years, each user would have to bring in 0.50 euro per year as commission

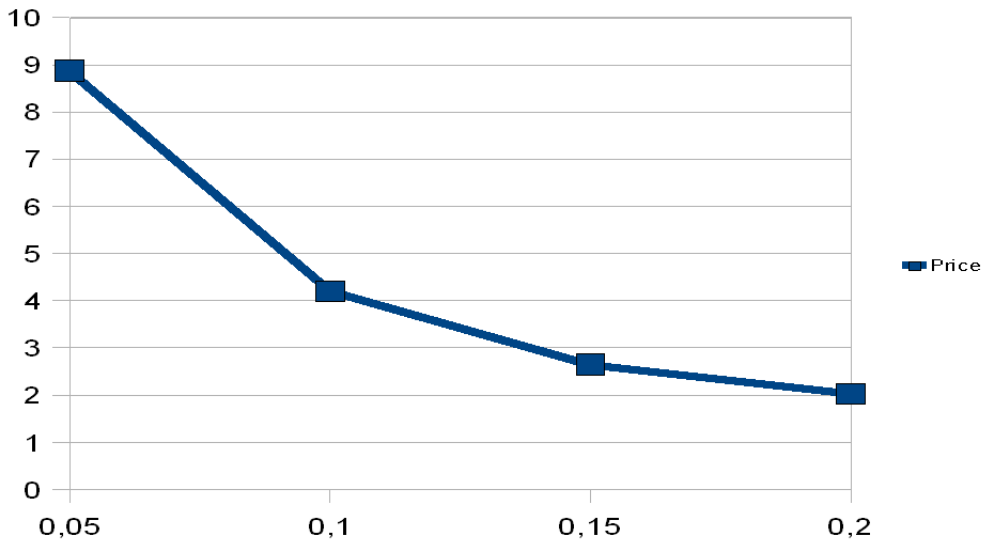

Figure 19: Sensitivity - user fee

to reach the revenue increase of the nominal value of the advertising model (10 685).

3.4.6 Costs

When the value of the income of the project is known, the maximum costs could be limited to that amount. Most of the costs in this case would be the original investment in building of the mobile interface. Minor part would be the costs of upkeep for the mobile interface, which would have to be discounted to present value for years two and three. If the mobile interface is kept simple, the upkeep might not be significant. One tenth of the price of the maintenance for the regular site would be around 1000 euro. If the nominal value of 10 500 euro is used, a little less than 10 000 euro might be the maximum cost for building the interface.

Whether this is a realistic price for a mobile interface's development is another case. With an hourly rate of 25 euro there would be room for 400 hours of development, but with 50 euro per hour only 200 hours.

3.5 Summary

In this chapter, the Jatkoaika web magazine mobile interface project case was motivated. Proposed solutions evaluated using STOF approach and the details of the case. In next chapter the results of are analyzed to find answers for the research questions of this thesis.

4 Analysis

In this chapter, the results of the study from the previous chapters are analyzed. This is done to find answers for the research questions of this thesis. Also the methods used are viewed in retrospective.

4.1 Research questions

The main problems this thesis tries to find answers to were described in Section 1.2. There were four research question, which are going to be answered in the following sections.

4.1.1 Demand for interface

The first research question was *"RQ1: Is there demand for a mobile web interface? What type of mobile interface would have the most demand?"*. This question seems to be pretty easy to answer based on the study.

The number of people who use the site on a mobile device is clearly rising, based on the statistics presented in Section 3.1. Also the user questionnaire presented in Section3.2 shows that 60 percent of the users would prefer some kind of mobile tailored interface.

What is harder to say is what kind that mobile interface should be. The question about the purpose of mobile use in the questionnaire does not answer to this: most people could not specify why they use mobile Internet, but rather say their usage is similar than the normal Internet usage. Also information seeking and just surfing were as popular as explanations.

The two options proposed were simple mobile interface with only some content of the site and a fuller mobile friendly interface. Since most of the mobile interfaces in Finland are quite simple, it could be that the users who say they would prefer mobile tailored interface would mean that kind of interface. Another point that would support the simple interface is that the bounce rate seems to be quite high also among the mobile users. This would suggest that a lot of people just look at the main page rather than try to find some particular information.

4.1.2 Key factors

The second research question was *"RQ2: Which are the key factors when building a mobile interface?"*. To get an answer for this question, the critical success factors and critical design issues were looked into in each STOF domain in Section 3.3. The following were the main findings:

- Target group of the service includes both those users who already use the regular interface with a mobile device and those users who do not do that. There

should be a way to cater a new service for both of those groups simultaneously.

- The site and information on it should be easily accessible for the user, which is a major point in the thesis. Only this way the service has value for the users. The material on mobile browsing experience on Section 2.2.2 is the core for deciding what kind of design is needed to make the interface usable.

- The integration of the mobile interface with the site seems to be a big part of the technical work in building the interface. This means handling the material already on the site and the new features introduced after creating the mobile interface. When considering the amount of work needed for building the interface, the integrations has to be taken into account.

- It is important to be the dominant actor in all the scenarios. The other actors in the project should not be given privileged rights for the service they provide. The agreements should be flexible so that the publishing organization has the lead role.

- The resources of the organization have to be considered also outside the capabilities of just building the interface. The solutions should not make running the mobile interface put too much strain on the editors who provide the content for the site.

- The initial financial investment is the biggest risk in the project. The following costs are not significant. If the project does not work, the following costs can be stopped. However, the initial costs might not be recoverable, if the solution and the project do not work as calculated.

- The technology seems to be changing fast. This means mostly the end user mobile devices and their connections. Because of this, it is not easy to say what kind of services are possible and valuable for the users in the future. As a result, the current solutions can be reliably designed only for quite a short period of time.

- Any solutions would have to have costs in line with the estimated revenue. Estimating the revenue is not exact, but some calculations can be made. The maximum initial costs of the interface can then be budgeted. The maximum cost dictates what kind of interface can be build.

Based on these key factors, it is possible to evaluate possible projects: If these factors can be effectively taken into consideration in the plan, the project and solutions seem feasible. If that is not the case, another solutions or not building a mobile interface should be considered.

4.1.3 Financial viability

The third research question was: *"RQ3: How viable are the revenue models that could be used for the mobile interface"*. This question was handled in the Section 3.4 with the estimation models.

The answers from the calculations was that the cumulative increase in the advertising income during a three year estimated period of operation for the mobile interface would be roughly 10 percent of one year's advertising income. If subscription model would be used, the fee would have to be about 2.6 euro per month to reach the same level of income. The transactional model would need 0.50 euro commissions per user per month.

The viability then depends on the price of the project. It could be challenging to build a site with such a small investment. A simple site could be possible even with such small investment.

4.1.4 Selection solution

The final research question was *"RQ4: Which strategy would be recommended for the mobile interface project?"*. Answering this question is basically selecting a solution based on the study of the thesis and the answers to the previous research questions.

The answer seems to be to build a simple mobile interface. Although the financial factors do not clearly suggest building an interface, the following reasons would support this action:

- Those users, who might prefer the more complex mobile interface are also more likely to use the regular interface already.
- The mobile users who move from the regular interface to the new mobile interface also reduce the income of the current site. Thus it is more effective to try to get new mobile users altogether.
- The time the new mobile interface is likely to be used is long. Just building a simple interface now would allow re-thinking of the issue in a natural time frame.
- It might not be necessary to include all the previous material on the site to the mobile interface. Thus the integration work would not be big a problem.
- Building the mobile interface could help by building the brand and attracting more users on the site.

For the revenue model the advertising model would seem to be the most reasonable one. The other models do not seem to provide better results and the advertising model is already in use on the site. Also if the subscription model would be used, the brand building would not happen in the same way.

4.2 Methods and Results

The methods used in the thesis and the results they produce can be analyzed too. The STOF model and the financial estimations were the main tools in this work and their usage has to be considered critically. The user questionnaire gave also additional results other than those mainly searched for.

4.2.1 STOF model

Much of the work is based on the STOF model, which is created for business plans of mobile services. The mobile interface this thesis works on is arguably not quite the kind of new service the model is often applied to. This means that applicability of the model is something that can be discussed. Overall, the model is certainly useful even in a case like this, as it provides a good framework to base analysis on. Many of the CDIs and CSFs are usable as they are described in the model.

On the service domain, a new way to present existing content is a service, but it can also be considered to be just enhancement of existing service. Still, the approach that underlines the importance of the service domain and the value proposition seems wise. The factors in the organization domain are usable as they are described, although a mobile interface like this could possibly be built with a simple organization.

Furthermore, on the technical domain much of the technical issues are focused on the end user devices, connections et cetera. The uncertainties in that area are important to take into account. However, it seems that a browser access based service is easier from technical perspective. The ecosystem they work in is simpler than those of some other services. The financial domain is again something that is clearly applicable for a case like this too.

One particular thing noticed during the work is the differentiation of the customer and the user. In the STOF model it is taken into account that those two are might be different. That is the case if a mobile interface's revenue model is advertising based. Then the users are the browsers but the customers are the companies buying the advertising space. Those two are quite remote from each other. This problem could be overcome by selecting a target user group so that it is good for intended advertisers. After that the value proposition can be designed so that it works for the selected target group.

4.2.2 Financial estimations

The financial calculations and estimations are big part of this work. There are some things to keep in mind when considering the results of the estimations. As mentioned in Section 2.5.3, the models as just as good as the values they are based on. In this case, many of the values are rough estimations. Even with the sensitivity analysis, the results of the calculations have to be considered only partly accurate.

The models them self should be more accurate.

On more detailed level, one thing to notice is that the numbers on the calculations refer to the number of users. The important statistics for the site are in total numbers of visits rather than visitors. Since it is not possible to know if different users generate different number of visits or page views, the number can be reasonably well estimated with the number of users.

Also the reduced regular site advertising income calculation is missing the possibility of some of the new mobile traffic actually replacing some computer traffic. This is likely an insignificant amount and would be hard to estimate. On the other hand, the mobile users who move from the regular interface to the new mobile interface might not generate as much advertising income on the regular site. The mobile web click through rate was considered to be at least the same as on regular web, but mobile user click through rate on the regular interface might not be as high.

4.2.3 Questionnaire results

Another big part of the work is the user questionnaire. The questionnaire received fair number of answers in rather short time, and the results seem to be quite clear and mostly expected.

One thing to notice is that maybe even surprisingly many users seem to prefer the mobile tailored interfaces. This was in line with the previous studies referenced. However, those studies are already a couple of years old. During that time the devices and connections have improved. It might have been expected that more people would have preferred the regular interfaces. Some of the reasons for these findings might be the following:

- The mobile connections in Finland are cheap, and thus more people use the mobile Internet.
- In Finland, the touch screen phones with large displays do not seem to be the only ones people use the mobile Internet. It could be easier to use tailored interfaces with other devices.
- People simple want to use the tailored interfaces, no matter if the devices and connections get better.

The latter point could be supported by the fact that according to the questionnaire, almost no one uses only mobile tailored interfaces. That was something people seemed to be doing according to the previous studies.

Another point seems to be that both the willingness to pay and the transactions on the mobile Internet are higher for the older age group (25-41 years) compared to the group of under-25s. This seems logical, because of bigger purchase power of that group. This would mean that a site or an application targeted to that group could have better chances to work. On the other hand, if the site is targeted for

bigger range of people, it might be better to stay away from revenue models that need direct payments from the users.

4.3 Summary

In this chapter, the research question of the thesis were answered. The recommended action for the mobile interface project is to build a simple mobile interface using the advertising model. Next the work is concluded.

5 Conclusions

The final chapter concludes the work as a whole by going through the main results of the work and discussing the limitations and exploitation of the results. Also future research opportunities are discussed.

5.1 Results

The purpose of this work was to investigate what should be done with the planned project to build mobile interface for Jatkoaika.com web site and whether this project is feasible.

Overall the mobile usage on the web site is increasing sharply, based on the statistics collected. During the last year the mobile usage has over doubled. This has happened even though no mobile interface for the web site exists. Based on the user questionnaire, majority of mobile users would seem to prefer mobile interfaces of web sites. This was the answer of 61 percent of the mobile users. As a result, demand for mobile version of the site is apparent.

The financial viability of a mobile interface is questionable. There is still not a large number of mobile users or high prices on mobile web advertising. Based on the financial estimations, the advertising income of first three years would be around 10 000 euro. Only 5 percent of the mobile users were willing to pay for usage of a mobile interface. As a result, the investments that could be made are limited.

STOF-model was used as a research method in this thesis. The model and its Critical Success Factors were found to be useful, even if they are mainly created for larger and more complex mobile service models.

5.2 Limitations

Overall, this work seems to reach the objectives that were set for it. All the research questions were answered reasonably well, which makes the work valid. The results of the work are partly qualitative and thus subjective. There are some factors that hinder the reliability of the results.

A lot of study done in the usability and user experience on mobile browsing. However, a lot of this work is not recent, which hampers this study. This is the case especially when considering the fast pace of change in technology of the mobile devices and connections.

The financial calculations can be considered only as rough estimations, even though sensitivity analysis were performed. The biggest single setback was the missing advertiser interview. Since there was not enough data, this part of the work could not be completed. It would have helped to estimate the advertising income of the mobile interface more precisely. Having understanding of the prices of mobile

advertising and being able estimate how much interest in advertising on the mobile web interface exists would have helped.

The Jatkoaika web site's income in quite small and the investments in the mobile interface would also be quite small. The size of the project affects the generality of the results. If the same method would be applied to some other case, the results might be different depending on the content and size of the site. However, number of smaller sites exist in the Internet. The results could be useful in those cases. The calculations and the questionnaire can be repeated for this or any other case quite easily, if needed.

5.3 Exploitation of the results

The most obvious exploitation of the results of this work is the help to find a direction for the project this work covers. Based on the results, the recommended action is to build a simple mobile interface. The recommended revenue model is the advertising model. This way the mobile users would have better value from the site, which would help building the brand.

It good to realize that the mobile interface build based on the findings of this work is most likely going to be temporary. The project should be scaled accordingly and there will need to be preparations to re-think the issue in some years time.

Although the scope of the work was quite limited, it includes some additional material that could help on the project. It is important that this material is used to exploit the results of this work to the full amount. In addition to the answers to the research questions, there were also a number of findings on how to build an interface that is friendly for mobile users.

The results can be used to present the case of advertising on the mobile interface to the advertisers. If they have a better picture of the mobile users, they might be more willing to buy ads on the mobile interface. The revenue estimations could also be used to set a price on one sponsoring party buying and branding the mobile interface.

5.4 Future research

The field of mobile browsing seems to be changing a lot at the moment. As a result, future research is needed even for researched topics, when the mobile segment changes. The change might not be just gradual improvement of the technology, but rather something that changes the landscape, like tabled computers entering the market.

On this particular project, there would be a lot of room to study the actual usability and ways of building the mobile web interface. That would be more of a technical study compared to this work. It would be helpful and interesting to have had some prototypes of the different solutions for the mobile interface. In that case there could

be user study on which interfaces the users actually would prefer.

Also specifically to this work, the applicability of the STOF model to mobile web interface case like this could be further researched. The key factors based on the CSFs and CDIs of the model could be reviewed after the project this thesis covers has been conducted.

On the financial side, there might be room to study the differences between mobile web interfaces this work concentrated on and the downloadble applications that could be used to deliver the content to users. There seems to be the idea that it is easier to generate user fees based revenue with applications, although the content would be similar.

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