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Thesis Title: Developing and Evaluating Web Marking Tools as a Complementary Service for Medical Telephone-Based Advice-Giving

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Abstract
This master thesis reports on potentially useful applications for “The social layer concept”, consisting of a combination of telephone-based health advice-giving and dynamic marking of shared web pages, with the aim to contribute to the online health counselling domain. An experimental user study was performed to test a web marking tool prototype. The experimental tool was shown to be useful in helping clients focus on relevant health information and dynamic web marking does provide a useful and complementary service to telephone-based advice-giving. It was considered most useful for complex health advice-giving issues.

Keywords: social layer, telephone-based health advice-giving, dynamic marking, online health counselling, web marking tools.
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1 INTRODUCTION

New and effective tools for information sharing and building computer-mediated knowledge repositories are being introduced by information and communication technologies in the field of e-health worldwide (Seçkin, 2010). A broad range of new e-health applications, such as ubiquitous health information websites like Medline Plus, Healthfinder, and Web MD (Medline Plus, 2014; Healthfinder, 2014; and Web MD, 2014), online social support networks, interactive electronic health records, health decision support systems, tailored health education programs, healthcare system web portals, mobile health communication devices, and advanced tele-health applications are considered promising in increasing consumer and provider access to relevant health information, enhance the quality of care, reduce healthcare errors, increase collaboration, and encourage the adoption of healthy behaviours (Kreps & Neuhauser, 2010).

Current trends describe a variety of directions and areas of research that are expressed in the form of application development. The common characteristics of e-health applications briefly presented above are determined with the improvement of people’s health, the provision of better information support and healthcare, etc. Our interest specifically lies in the idea of using the web, with its vast resources and person-to-person interactions, with the purpose to use them together instead of separately, which is often the case. In turn, this study is conducted in the area of e-health, ICT, and web technologies in the context of medical advice-giving and focuses on improving medical counselling in this process.

The study was conducted in collaboration with the 1177 organization that provides telephone health counselling, as well as with the support of Martin Östlund and his colleagues in the department of Media Technology in Linnaeus University in the ongoing study of a social layer project in the field of e-health (The Social Layer - Populating the web through social layering, 2015). While the social layer is an abstraction that lies on top of the usual Internet network, it is the space that covers the entire web (Östlund, 2015). The social layer is accessible from any device and is limitless within the web. However, it can have conceptual limits by way of technical limitations and also security restrictions.

Social actors and their occurring interactions are placed within this abstraction. This concept is implemented by using the shared screen view that makes it possible to interact with other users visiting the same place on the web. In this context, the interaction is supported through marking and focusing functionality of the web content.

This master thesis explores web-based markers of shared web pages as a complementary service to voice-based advice-giving for the purpose of increasing the preciseness of web content and makes use of the web as an information resource, where voice-based advice-giving is presented as real-time communication between the nurse and patient.
Our aim is to contribute to the health counselling domain by exploring the combined use of live telephone-based advice-giving and web-based information for health advisory purposes.

The developed prototype served to the research and refinement of the idea of using the concept of web marking tools with the aim to implement this approach in practice for the 1177 organization. This in turn could have a positive impact on health counselling. The introduction of this approach may make information provision and medical support gain greater confidence in the successful resolution of complex issues and provide another line of support for people in relation to medical issues.

Since this is a pilot study, the importance of this research was to explore the issue of usefulness of the concept of web marking tools as a complementary service to medical telephone-based advice-giving in addressing specific health issues. The research allowed identifying the topics and issues that require further in-depth study. Namely, this research paved the way for further studies such as the eye-tracking study of analyzing marks.

The main achievement of this work is the identification of potentially useful applications of web marking tools and features for further development. The features can be explored later to prove the concept that web marking tools can be useful in certain situations.

The research scope was limited by factors such as that the technological solution had to be complementary to the current system of medical advice-giving at the 1177 organization - limitation of stakeholder; and the web that is supposed to be a medium for technological solutions, is limited by the guiding concept.
1.1 Problem definition

Nowadays medical advice provision can be delivered through various technologies, formats, and media. Our research particularly focuses on the domains of telephone-based and web-based healthcare information.

In recent times, telephone communication has played an important role in health education, prevention, and counselling (Soet & Basch, 1997; Mevissen et al., 2012). During a telephone conversation, the consumer receives immediate feedback, leading to ease of use for the consumer. Additional or clarifying questions can be asked if something is not clear for the consumer or the counsellor. Moreover, Mevissen and colleagues have stated that the counsellor who communicates real-time may be more persuasive and supportive than counselling provided in an asynchronous manner, by way of email or chat (Mevissen et al., 2012).

In turn, the existing limitations in verbal telephone communication could cause misunderstandings and improper following of the advised instructions: When there is a need to explain a certain sequence of actions or emphasize the importance of a particular aspect or phrase; when it is required to memorize and to perceive lengthy information for the recipient; and when there is the need to increase precision in giving instructions.

These limitations are important because they could lead to negative consequences for the health advice seeker even if the instructions are simple since the adviser could not be sure that the client has understood the instructions completely and that a mistake would be very dangerous. Specifically, the 1177 service reported a case of dehydration of a child when telephone counselling led to negative effects for the child’s health, and this case led to a ban on counselling on given questions over the phone (Interview with 1177 Kalmar staff. 3 April 2013).

The use of web-based health information in healthcare is rapidly increasing and has been termed as the e-patient revolution (Akerkar & Bichile, 2004). Authors Gerber and Eiser (2001) have stated that health information on the web may make patients better informed and led to a better resolution of issues on health advice and more appropriate use of health information resources.

In addition, web-based health information may enhance communication between the advice seeker and the counsellor, and offer opportunities to improve the physician–patient relationship by sharing the burden of responsibility for knowledge (Robinson et al., 1999; Gerber & Eiser, 2001).

However, the use of the web for healthcare information has a number of disadvantages.

For instance, web-based health information may be misinterpreted or misleading, compromising health behaviours and treatment, or resulting in unnecessary requests for clinical interventions (Eysenbach & Kohler, 2002; Ahmad et al., 2006). In addition, misinformation can create unnecessary anxiety and/or preventable morbidity or even mortality (Weisbord et al., 1997; Kiley, 2002).
A combination of telephone-based and dynamic marking of shared web pages for healthcare information may allow counsellors and health advice/information consumers to take advantage of the respective strengths of each type and enrich the health counselling process.

This approach consists of using the web-based marking of shared web pages as a complementary feature to voice-based advice-giving and it is still unexplored in the field of research on health counselling.

It is a challenge to find a potentially useful solution to resolve the health counselling issue, and which would be potentially useful in such voice-based health advice-giving as well. The interesting nature of the problem is in determining the usefulness of the developed solution in the context of current research conditions.

The social layer concept introduced earlier can be suitable to combine telephone-based counselling and health care information on the web, but it requires some tools to highlight and select the web content. These tools can be given the name web marking tools, and they will be described later in this chapter.
1.2 The Purpose of the work

The purpose of this thesis is to conduct an empirical study to explore potential usefulness of web marking tools as a complementary service to existing voice-based health advice-giving.

This purpose requires the design and implementation of a complementary web-based medical advisory service that boosts the preciseness of the web content. In other words, the primary intention is to use web marking tools to make the content more precise.

The concept of potential usefulness is applied, in the sense of potentially useful applications of the proposed combination of telephone-based and dynamic marking of shared web pages to health advice-giving purposes. Considering the above statement, this research is guided by the following main research question:

– **What are potentially useful applications of web marking tools as a complementary service to medical telephone-based advice-giving?**

In the Design of web marking tools section, we will describe in detail our initial thoughts regarding the possible design concepts and present some explanations about the implementation approaches that were used.
1.3 Terms and definitions

In this thesis, we will use terms that describe the actors participating in an advice-giving session. The first pair refers to adviser and advice (information) seeker that are used in accordance with information communication theory; and the second one comprises the terms nurse and patient as used in relation to the professional title of the advice giver and the latter, in general, to any recipient of healthcare services (Wikipedia. The definition of the patient term. 2014). It’s important to mention here that the advice seeker can also be any person who seeks allied professional medical advice pertaining to relatives of patients, other health services workers, and home healthcare nurses.

The next set of terms—usefulness, utility and interests—can be applied to medical advice-giving in the context of the co-browsing concept. Since the present study deals with the issue of medical advice-giving, we should set a definition to be used in further discussion.

– **Medical advice** is the provision of a formal professional opinion regarding what a specific individual should or should not do to restore or preserve health (Wikipedia. The definition of the medical advice term. 2014).

In the context of a medical advice-giving session, the interests of the two participants can be distinguished into the interests of the nurse and those of the patient. Let us look at the interests of the nurses.

Nurses have a specific role and specific responsibilities tied to that role. They have to make sure that the patient 1a) has the information he/she needs, 1b) understands it, 1c) is motivated to act in accordance with it; as well as that the patient 2a) feels safe and secure, 2b) feels confident, and 2c) feels in control (as far as possible given the obvious sources of uncertainty and threat in the situation).

Utility, in general, refers to useful objects or use that give the ability to perform certain functions or actions. In the context of web marking tools, utility in medical advice-giving means the ability of the qualitative and effective performance of features that enhance the preciseness of web content during medical advisory sessions.

Since potential usefulness is being investigated in this research, its definition will be reformulated with regard to the co-browsing concept in medical advice-giving.

– **Usefulness** is the quality or fact of being useful in the co-browsing approach and implementing web marking tools as a complementary service for telephone-based medical advice-giving.
In other words, by potential usefulness we mean the qualities, applications or usage scenarios of web marking tools as a complementary service to medical telephone-based advice-giving to benefit the health counselling process. This tool’s potential usefulness was examined through the qualitative parameters of its (utility) ability to perform certain functions. In addition, the goals of medical counselling need to be listed because the conclusions will be formulated with regard to them.

The purpose of medical counselling is to allow people to get answers about their health problems and begin to treat them without delay. Counselling should provide quality and professional solutions for those who seek such help. These statements will be used later during the discussion of the user study results from the evaluation of the prototype service application.

In conclusion, something is recognized as useful if: It a) meets someone’s interests, b) ensures/supports the achievement of its goals, c) allows to achieve results that are close to the set goals (supports successful achieving of goals), and d) lets one do things with the lowest cost (contributes to effectiveness).

The last two terms that need to be presented are web annotation and web marking tools.

– **Web annotation** is an online annotation associated with a web resource, usually a web page. By means of the web annotation system, a user can add, modify or remove information from a web resource without modifying the resource itself. The annotation can be represented as a layer on top of the existing web resource, and this annotation layer is usually visible to other users of the same annotation system (Wikipedia. The definition of Web annotation term. 2014).

– **Web marking tools** are web instruments that allow the social layer users to highlight and frame the web content in the context of shared web space without the modification or removal of information. The main purpose of marking tools is to dynamically focus attention on specific content. In the thesis will also use the term dynamic marking to stress out dynamic nature of web marking tools usage during advice-giving session.

The overview information about 1177 organization and observations from interviews with 1177 Kalmar staff members will be presented in the next section.
1.4 1177 organization

The 1177 organization and its website www.1177.se, formerly www.sjukvardsradgivningen.se, provides information, advice and services pertaining to healthcare. The site is hosted by Inera AB, a company that is owned in common by all Swedish counties and regions (Wikipedia. The description of 1177 organization. 2014). The 1177 organization is a part of 1177 Health Care Guide. 1177 offers healthcare advice, information, inspiration, and online business on the web as well as phone, and is open round the clock. In order to apply for healthcare in Sweden, the URL is www.1177.se and the phone number is 1177. Each county/region in Sweden runs its own medical advice that is part of a national network and complies with national quality standards (1177 organization About page. 2014).

The phone number 1177 is the national number for medical counselling by phone. The country receives about 5.5 million medical advice calls each year (1177 organization, About page. 2014). 1177 nurses over telephone answer the questions of advice seekers over telephone, assess their care needs, and advise and refer them to the right kind of reception when necessary. Based on the description and characteristics of complaints, the nurse on the phone verbally explains to the patient what to do and what action to take (Interview with 1177 Kalmar staff. 3 April 2013). The interview questions can be viewed in Appendix A.

Information support systems are used in the process of advice-giving (1177 organization, About page. 2014). The nurse then inputs the patient’s complaint into this system and receives a variety of illnesses and medical conditions in accordance with the entered symptoms. This system is used in order to identify situations that require emergency medical care (Interview with 1177 Kalmar staff. 3 April 2013).

Employees of 1177 have no problems with the use and operations of the web and information systems, and have excellent skills in working with the web, mobile devices, and applications (Interview with 1177 Kalmar staff. 3 April 2013).

In general, the 1177 organization acts as the first line of health counselling received through telephone communication accessible to the overall Swedish population. It’s main task is to figure out the level of emergency of a patient’s health issue. Based on the analysis of the situation and the health issue, the patient is redirected to an ambulance (or an ambulance is sent to him/her) if the particular health issue requires such a measure, redirected to the patient attending doctor in case of daily health issues, and provided relevant health advice if the needing is for primary healthcare support.

The problems that 1177 organization is facing lies in limitations of telephone technology, namely when it is required to memorize and to perceive lengthy information for the recipient; and when there is the need to increase precision in giving instructions.
These limitations were mentioned during an interview with the manager of the 1177 Kalmar department also with the case of dehydration of a child mentioned above in Problem definition section. In particular, the manager said it was always difficult to explain medical information and be fully confident that the advice seeker had understood what was said (Interview with 1177 Kalmar staff. 3 April 2013).
1.5 Roadmap of thesis

First, a detailed literature review, an overview of the social layer concept are presented in order to:

1) give explicit description and ensure understanding for the reader of current trends in ICT in e-health and to summarize the requirements for solutions based on the literature review;

2) familiarize the reader with the social layer concept, its characteristic features, and how it can be used to answer the research question.

This constitutes the background information related to the research.

Next, this thesis is divided into two main parts on the implementation and assessment phases to ease the reader’s understanding as well as to ensure correct arrangement of the relevant information.

The first part Design and Development of Web Marking Tools for Online Health Counselling chapter is related to the design and development of a complementary prototype to a telephone-based health advice-giving service. This chapter includes 4.1 Design of web marking tools, 4.2 Development of web marking tools and 4.3 Summary sections respectively.

The section 4.1 Design of web marking tools includes 4.1.1 Design methodology, 4.1.2 Use cases, 4.1.3 Design of web marking tool features and 4.1.4 Difference between markers and static highlighting.

The section 4.2 Development of web marking tools includes 4.2.1 Overview of health advice-giving session and 4.2.2 Technical implementation subsections.

The second part Evaluation of Web Marking Tools for Online Health Counselling chapter contains the description of the experiment design for application evaluation. It also describes the results obtained during the experiment, and this is followed by the discussion chapter. Finally, the theoretical and practical outcomes are discussed and the most important findings are summarized. Also, some future research questions are proposed for further investigation in the Appendices.

The thesis is structured in such a way because the work on the present study was carried out in two stages. The first stage was to design and develop the web marking tools. The second stage was the actual assessment of the web marking tools, including the experiment design, and obtaining the experiment results, followed by their assessment and analysis. The formulation of conclusions was conducted last.
2 BACKGROUND

This chapter presents the literature review to describe the current research trends pertaining to online counselling, information communication technology in healthcare and design guidelines for effective health counselling applications.

2.1 Literature review

In the Problem definition section, the existing problems associated with communication during a medical telephone-based advice-giving session were presented.

In order to find possible solutions to these problems, the first step is to explore and examine existing e-health studies to gain an overall view of the research direction of ICT in health counselling and to identify the requirements for designing a research solution design. Since our research subject is about health advice-giving, it is necessary to conduct a literature survey of the research fields related to online health counselling.

The choice of online health counselling investigations was based on the search for potentially useful healthcare solutions and extracting substantial design guidelines from these solutions. These guidelines will be used for designing our solution.

2.1.1 ICT in health counselling

Since the late 1980s, e-health communication has been considered a promising improvement on traditional communication in the healthcare sector through user-centred designs and interactivity, broader social connectivity, deeper understanding of what motivates behaviour to change beyond ‘risk’, and the use of diverse media that expand access to health-related information for information seekers (Neuhauser & Kreps, 2003). In turn, the research process of e-health communication and overlapping disciplines continues to this day. An important part of this trend is constituted by the studies on remote/virtual healthcare.

While and Dewsbury (2011) have stated in their study that the growth of remote healthcare communication, namely counselling, is inevitable and provides the means for significant changes in healthcare delivery, especially for distant patients/information seekers. It allows information seekers to access healthcare and advice directly from their home or other places using various devices such as smartphones or laptops, and it may enable the personification of healthcare with information consumers taking control over their own health and health records. While and Dewsbury (2011) have further stated that today there is a demand for a healthcare approach that allows patients to access health-related information and services 24x7 throughout the year similar to the access to other services available through the telephone and internet.
With reference to healthcare consumers, Loader et al. have indicated that computer-based health information is being increasingly perceived to be essential to health and well-being (Loader, Hardey, & Keeble, 2009).

Lustria and colleagues (2009) have pointed out that the rising cost of healthcare is considered a convincing argument for developing more effective health counselling and communication strategies that aim to improve health costs for different types of healthcare consumers by using a wide list of technologies and in different settings. Another point that requires to be mentioned is the issue of aging population.

By 2020, the older population is projected to outnumber the younger population (Fent, 2008) and this combined with the increasing prevalence of chronic illnesses (World Health Organization, 2003) will create a huge demand on finite resources in terms of both money and personnel (Kinsella & He, 2009). While and Dewsbury (2011) have rightly pointed out that the use of information and communication technology (ICT) offers a range of potential solutions to this healthcare challenge.

Furthermore, While and Dewsbury (2011) have opined that incorporating ICT into remote nursing counselling practice will change health advisory work in the context of practice with greater demands being placed on the nurses’ ICT and remote communication skills. In addition, While and Dewsbury (2011) have said that patients need not be the only beneficiaries of greater access to information because ICT also provides the opportunity to increase the nurses’ accessibility and, therefore, boosts their effectiveness.

Next, we will briefly discuss the needs of healthcare from a professional perspective and, therefore, the aspects that the research needs to focus on.

Healthcare is characterized by the need for experts in many roles (physician, nurse, etc.) and in many settings to collaboratively perform complex tasks between professionals or even including the patient as an active participant (Safran et al., 1998). During healthcare counselling and treatment procedures, patients interact with many individuals in different roles, where each specialist requires a high degree of specialization and has clearly defined responsibilities. That is why Safran et al. (1998) have perceptively stated that patient care is an ideal domain for exploring the effects of computer-assisted collaborative systems on complex real-world environments.

The challenges and potential benefits of computer-assisted collaborative systems will be explored in the following section as applied to the field of online health counselling.
2.1.2 Online health counselling

Online health counselling seems to be a potentially interesting and useful domain for solving existing problems and challenges. Technological developments have grown in the past 15 years or so (Richards & Viganó, 2013). In review, Richards and Viganó (2013) have stated the potential effectiveness of therapeutic relationships in virtual/online environments. Also, a similar analysis of e-health studies conducted by Neuhauser and Kreps (2003) has found promising results in the use of computer-controlled telephone counselling, personally tailored communication, and online support groups for promoting health with regard to e-health intervention purposes.

Separately, we also note the challenges expressed by Hackerman and Greer (2000), Sussman (2004), and Bambling et al. (2008) in relation to online counselling that counsellors might struggle to develop an effective working alliance due to the lack of nonverbal cues, such as tone of voice that contribute to face-to-face and telephone communications, but this depends on the type of online counselling where some versions do not support nonverbal cues (e.g. text-chat). This limitation appears to be very significant, and the solution can lie in a combination of online counselling and telephone communication.

These thoughts point to the study of functional means by which such outcomes have been achieved in online counselling. These tools include synchronous (chat and video conferencing) and more common asynchronous (e-mail) communications, and combinations of these have been used to support online counselling as a standalone service or complementary part to other services (Newman, Szkodny, Llera, & Przeworski, 2011). Some web-based and self-administered treatments for a variety of healthcare issues have included online counselling support, usually in the form of asynchronous post-session feedback, which points to increased adherence and yield enhanced outcomes (Richards & Richardson, 2012).

These statements suggest the potential utility/usefulness of the web as a medium for medical counselling. By following the same thought process, many researchers, specifically McMellon and Schiffman (2002) and Opalinski (2001), have rightly concluded that the internet, as a computer-mediated information provider, contributes to the decision making process of online healthcare consumers, who want to be self-directed and gained greater control over their own health. According to Kadry et al. (2011), the number of people looking for health-related information online has grown steadily and accounted for about 88% of American adults in 2011, which was a 10% increase from the previous year. Also, Ericksen (2008) has pointed out that the internet offers patients instant access to information that can be specific enough for their personal needs.

In addition, Lustria and colleagues (2009) have argued that the combination of web delivery and computer-based tailoring holds promise for increasing the efficacy of tailored health behavioural interventions and counselling. They have also rightly pointed out that web environments are useful since they allow the inclusion of a variety of interactive components that can expand user experiences and support the achievement of health counselling goals (Lustria, Cortese, Noar, & Glueckauf, 2009).
Seçkin (2010) has also indicated a very good point that healthcare consumers accustomed to the information they obtain from health websites and services use it to inform their own decisions about illnesses, possible treatment options and medications, and other related medical issues.

We will further consider the design guidelines that may be made for such services, or generally speaking for healthcare information systems. They will be provided from a historical perspective.

It is important to mention that Valdes, Kibbe, Tolleson, Kunik and Petersen (2004), Kuhn & Giuse (2001), and Van Der Aalst (1988) have assumed that this would require web-based systems to easily and efficiently interconnect different healthcare sites to support distributed healthcare co-operative work.

According to Smith and Farquhar (2000), a healthcare information system must run in a multi-user environment characterized by the presence of different types of users—i.e. healthcare administrative personnel, technicians, nurses, physicians, and the patients themselves. The authors have also stated that these different types of healthcare users should share various multimodal medical data, documents, information, and knowledge. On this topic, Beaudouin-Lafon and Beaudouin-Lafon (1999), Salzano & Bourret (2004), Bergh and colleagues (2003), Quaglini and colleagues, (2001) and Masseroli, Visconti, Bano, & Pinciroli (2006) have stated that such a system has to: work simultaneously or in different temporal moments, at the same location or in separate places even geographically distant; provide the ability to co-operate for the effectiveness of health counselling, and to be the best for patient healthcare; and have a mechanism for continuous feedback from patients, healthcare personnel and other types of actors.

Nowadays, there is an existing need in the field of e-health and ICT for healthcare to focus on the design and development of cost-saving and productivity-enhancing technologies for health systems (Stroetmann, 2013). Such a focus should be guided by principles, namely:

- To support seamless care and patient care chains across primary, secondary, and tertiary care, and within the home care section by providing timely, high-quality care, which are based on the most recent diagnostic data (Maass, Asikainen, Mäenpää, Wanne, & Suominen, 2008).
- That no one technology for delivering health information is most effective, although various types and combinations should be used (Tomlinson et al., 2013).

Kreps and Neuhauser (2010), in their reviews, have identified the major design to achieve the full potential of health communication/information technologies (HIT/HCT).

The first point states that online health counselling can be designed to maximize interactive communication with health information consumers and raise their involvement in healthcare. Smith (1989) as well as Kreps and colleagues (2010) have pointed out that effective health communication must include an active collaborative transaction between the sender and receiver—‘A spiral of changing feelings and beliefs’.
With regard to this opinion, Michael and Cheuvront (1998) have noted that such interactive participation is necessary to promote acceptance and internalization of health messages to effect change in the consumers of health information.

The second point means that health communication must be designed to work across many settings and with diverse types of healthcare actors (Kreps & Neuhauser, 2010). These arguments raise the issue of finding a technological approach that can fulfill these requirements.

The last point is that health counselling must be designed to use the appropriate media elements (text, graphics, or video) that can enhance the understanding and impact of e-health messages (Kreps & Neuhauser, 2010).

Based on the above-mentioned research studies, we have summarized a list of guidelines that various researchers have identified as being helpful/useful for health-advice needs (see Table 1).
Table 1. Summary of design guidelines for web marking tools based on literature review

<table>
<thead>
<tr>
<th>Guideline number</th>
<th>Description</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guideline#1</td>
<td>Collaborative performance of complex tasks between the health professional and patient in different settings.</td>
<td>(Safran et al., 1998).</td>
</tr>
<tr>
<td>Guideline#2</td>
<td>Availability of non-verbal cues in telephone setting.</td>
<td>(Hackerman &amp; Greer, 2000; Sussman, 2004; Bambling et al., 2008).</td>
</tr>
<tr>
<td>Guideline#3</td>
<td>Usage of web environments to include interactive components that can expand user experiences and support the achievement of health-counselling goals.</td>
<td>(Lustria, Cortese, Noar, &amp; Glueckauf, 2009).</td>
</tr>
<tr>
<td>Guideline#4</td>
<td>Multi-user environment characterized by the presence of different types of users.</td>
<td>(Smith &amp; Farquhar, 2000).</td>
</tr>
<tr>
<td>Guideline#5</td>
<td>Provide the ability to co-operate between users for the effectiveness of health counselling.</td>
<td>(Bergh et al., 2003).</td>
</tr>
<tr>
<td>Guideline#6</td>
<td>Combination of technologies to provide the most effective delivery of health advice-giving.</td>
<td>(Tomlinson et al., 2013).</td>
</tr>
<tr>
<td>Guideline#7</td>
<td>To maximize the interactive communication between the professional and the patient.</td>
<td>(Kreps &amp; Neuhauser, 2010; Smith, 1989).</td>
</tr>
<tr>
<td>Guideline#8</td>
<td>Health communication must be designed to work across many settings and with diverse types of health care actors.</td>
<td>(Kreps &amp; Neuhauser, 2010).</td>
</tr>
<tr>
<td>Guideline#9</td>
<td>Health communication must be designed to use the appropriate media elements (text, graphics, or video) that can enhance the understanding and impact of e-health messages.</td>
<td>(Kreps &amp; Neuhauser, 2010).</td>
</tr>
</tbody>
</table>
2.1.3 Web annotation

An online web annotation tool/application usually enables one to make text-based or non-text-based annotations on a web page or document by highlighting a specific portion of the text and adding a comment (Gao, 2013). An image taken from a case study on the use of the social annotation tool Diigo (see https://www.diigo.com/) to support collaborative learning (Gao, 2013) is given below (see Figure 1).

![Diigo interface](https://www.diigo.com/)

Figure 1. Text-based and non-text-based annotation

These annotations can either belong to a certain private group or can be shared publicly. Group members can see and respond to certain annotations or comments. Such types of annotations are commonly called social annotations because they enable users to discuss and learn a piece of text collaboratively without the constraints of time and space.

In his work, Gao (2013) has indicated that recent research studies have been showing an increasing interest in studying social annotation tools. Various collaborative social annotation tools have been developed—for example, the Web 2.0 annotation system that is used as a learning tool in an e-learning environment (Chen, Hwang, & Wang, 2012); Dinosys, which is an annotation tool for web-based learning (Desmontils, Jacquin, & Simon, 2004) and web personal annotation tools (Fu, Ciszek, Marchionini, & Solomon, 2005).

Also, studies have been conducted to explore the usability of social annotation tools as well as their effects on users’ motivations, learning, and social abilities (Nokelainen et al., 2005). Social annotation tools have certain positive characteristics that could be considered important in an online health counselling setting. Namely, electronic annotation allows users to take and share notes without face-to-face interactions, and information consumers can benefit due to the mobility of notes and contents through electronic annotation as well as the flexibility of time and place for reading and learning (Rau et al., 2004).
Interactions conducted with the support of such tools could be easy and effective. Rau and colleagues (2004) have argued that an individual’s reading and peer learning of information can be enhanced by electronic annotation at home or any place without the physical presence of counsellors or peers.

We can say that annotation facilitates the exchange of views, and paces the dialogue between the adviser/counsellor and information seeker in the context of health advice-giving. However, such an interaction needs to have the ability to provide immediate feedback in order to prevent misconceptions and mistakes. This brings to mind the point that the understanding of annotations by an information consumer must be accompanied by verbal communication.

On the other hand, design guidelines mentioned at the end of Background chapter can be fulfilled with the help of web annotation. Specifically web annotation may provide non-verbal cues in telephone setting (Guideline#2), it may support collaborative performance of complex tasks between the health professional and patient in different settings (Guideline#1). Additionally, web annotation can serve as basis for interactive components used to expand user experiences and support the achievement of health counselling goals (Guideline#3).

Furthermore the social layer concept possesses certain characteristics which also fulfill design guidelines required for web marking tools.

In the following section, the social layer concept is described and also a justification for why social layering is relevant and useful for the type of medical advise-giving that is examined in this master thesis is presented.
3 SOCIAL LAYER

This chapter presents the social layer concept utilized for design and development process of web marking tools. It also gives a description of social layer architecture and its justification choice for current research.

The Social Layer chapter includes 3.1 Socials layer concept description, 3.2 Social layer architecture and 3.3 Social layer justification choice sections.

As described in 1.1 Problem definition section the existing limitations in verbal telephone health advice-giving may lead to negative consequences for the health advice seeker. In order to solve this problem social layer concept is used to design a solution that will diminish the negative impact of these limitations. The social layer concept presented as shared screen view, marking and focusing functionality possess certain characteristics that could fit our research purpose. Detailed justification for using the social layer (and its components) as the design concept for this study will be presented in subsection 3.3 Social layer justification choice.

In our study, we make use of the social layer concept and its framework to create a complementary service for the establishment of an advice-giving session with support for dynamic markers of web pages. Our contribution is co-browsing web marking tools for a web service that is complementary to voice-based health advice-giving.

In the next section, we will present a description of the social layer concept and its architecture.

3.1 Social layer concept description

The social layer concept is about populating the web (Östlund, 2015). The social layer is an abstraction that lies on top of the usual internet network. It covers every part of the web and can be accessed from any web-enabled device. It is implemented by adding separate, but connected social dimensions to the web; it is an ubiquitous social layer on whose network users can see and interact with each other inhabiting the same place.

This concept is implemented by using co-browser technologies that allow the actors to interact with each other in any part of the network and, at the same time, to exchange information in various forms, for instance in text, voice or video.

One of the most interesting features of the social layer is that it can be filled with all sorts of tools and utilities used to interact/communicate with other users to extend or modify the content of the underlying web page, but the basic features are those mentioned: presence indicators to make the other visitors visible and approachable, and a message system. Users can activate the social layer by entering the web proxy portal, which enables users to see and interact with other users on the same web page.
The activation of the social layer can be carried out either with the authentication step or without it. Once the social layer is activated, it follows the user from web page to web page, and each location reveals the other users (those who have activated the social layer) on that particular site. The co-browsing system includes everything that is needed to create the functional layer, which is superimposed on top of the web page.

### 3.2 Social layer architecture

It is important to mention that this architecture overview of the social layer presents the implementation of this concept without the complementary service for health counselling purposes for the 1177 organization.

The overview of the social layer architecture is presented below in Figure 2. It is a general overview, which means this figure represents a generalized view of the social layer architecture applied to any domain-specific implementation.

The first element of the social layer system is a PageLoader subsystem (module). PageLoader serves like a proxy functionality. Any content or web page on the web can be loaded by using this functionality.

![Social Layer Architecture overview](image-url)

**Figure 2. Social layer architecture overview**
The PageLoader module provides functional API that can: 1) load any page to the iframe in one’s client web application; 2) provide access to manipulate the DOM of third-party web pages that the PageLoader function makes possible by circumventing cross-domain restrictions; and 3) also capture all link clicks and submit calls (search) on the loaded web pages.

The channel system (messaging system) provides communication functionality. It is a comet (long-polling) based system for data broadcast using the virtual main channel for sending and receiving messages. It also provides functional API for sending and receiving features.

The channel system is a platform-independent generic data push system that transfers data between connected clients. In a developed application, it is used for transferring data about markers (red frames, yellow marks). In both systems, JSONP is actively used for cross-domain Ajax calls, namely data transfer and loading content.

Since the audio/video server and utility server are not used in our application, they are not described in detail.

**App server.** One of the advantages of such architecture is that it can be extended by different web applications (or modules) that could run on other domain servers. These web applications could serve different purposes, for instance, they could use the social layer for e-learning, e-commerce or online health advice-giving purposes, as in our case. The app server is the actual location of our clients’ web application for marking tools. It runs on the web browser for active users (nurses and patients).

### 3.3 Social layer justification choice

The social layer concept is appropriate for our research because it offers the possibility to create a service to synchronize the markers between users. Another relevant characteristic of the social layer architecture is that it requires no installation and works with any web browser and on any platform. This is important for the 1177 service directed towards the general population, where we should strive to have an as low as possible threshold for entry.

The social layer architecture is flexible. The modular structure of the social layer enables the fulfillment of various requirements that are needed for the implementation of different information systems. Adding new modules to the social layer structure could enable new functionality, establish a new kind of application behaviour, and so on. The web is the essential environment component of a social layer. The web environment provides access to vast informational resources and enables the use of all interactive features of the web itself. It also allows the exchange of information in various forms, such as text, voice, and video.
The social layer itself allows the actors to interact with each other and to be simultaneously present at the same part of the network. In conclusion, we can say that such a modular structure allows the social layer to be complementary to other systems.

The table below (see Table 2) lists the social layer characteristics that could fulfill the design guidelines of the above-mentioned studies presented in the literature review.

Table 2. Social layer characteristics matched to design guidelines for web marking tools

<table>
<thead>
<tr>
<th>Guideline number</th>
<th>Social layer characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guideline#1</td>
<td>Social layer allows the actors to interact with each other in any part of the network at the same time.</td>
</tr>
<tr>
<td>Guideline#2</td>
<td>Web marking tools in the social layer setting can provide non-verbal cues like marks.</td>
</tr>
<tr>
<td>Guideline#3</td>
<td>The social layer concept is about populating the web and is an abstraction that lies on top of the usual internet network. It can be extended by different web applications (or modules), which, in turn, can include interactive components that can support the achievement of health counselling goals (like web marking tools).</td>
</tr>
<tr>
<td>Guideline#4</td>
<td>The social layer can allow actors to have different roles, which could have different features and functions to use.</td>
</tr>
<tr>
<td>Guideline#5</td>
<td>Users can activate the social layer by entering the web proxy portal, which enables them to see and interact with other users on the same web page.</td>
</tr>
<tr>
<td>Guideline#6</td>
<td>Social layer with marking tools could serve as a complementary service to existing telephone-based advice-giving.</td>
</tr>
<tr>
<td>Guideline#7</td>
<td>The social layer can be filled with all sorts of tools and utilities that can be used to interact/communicate with other users to extend or to modify content of the underlying web page, which, in turn, could possibly maximize interactive communication between the professional and the patient.</td>
</tr>
<tr>
<td>Guideline#8</td>
<td>The social layer covers every part of the web and can be accessed from any web-enabled device. Also, marking tools can be implemented to work on any web platform with different screen sizes and web browsers.</td>
</tr>
<tr>
<td>Guideline#9</td>
<td>The social layer allows the actors to interact with each other by exchanging information in various forms, such as text, voice, and video.</td>
</tr>
</tbody>
</table>
4 DESIGN AND DEVELOPMENT OF WEB MARKING TOOLS FOR ONLINE HEALTH COUNSELLING

This chapter presents design and development process of web marking tools by describing design methodology, use cases, design of web marking tools features, and difference between markers and static highlighting. It also gives a description of marking tools features and an overview of a health advice-giving session.

4.1 Design of web marking tools

4.1.1 Design methodology

The development process of the service presented in this thesis is methodologically based on the prototyping approach.

Prototyping has widely been accepted as a very useful demonstration and used as the means for idea stimulation during the development of complex products and systems (Du Bois & Gerritsen, 2013). This software’s methodological approach prototyping is the process of creating a prototype program usually checks the suitability of the proposed concepts for the application, architectural and/or technological solutions, and to present the program to the customer during the early stages of the development process.

Following the creation of a prototype, it is easy to get feedback from stakeholders or potential users at a time when it is most needed that is, at the beginning of the project when there is the opportunity to correct design errors with almost no loss.

With the help of prototypes, questions about a design or specific aspects of a design can be answered concretely (Yang, 2005). The strength of the prototyping approach to try out ideas and to gather feedback by providing a realistic experience of what the service will be like, and doing so early on in the design cycle instead of trying it out only much later when fully implemented.

In order to answer the research question, it was required to find out the potential usefulness of web marking tools, and, therefore, the prototyping approach was chosen to gather early feedback that can be used both to better understand the design of web marking tools as well as to provide specific formative feedback for future design work.

The prototyping methodology was chosen because, from the very beginning of the research, the aim was to create a solution that could serve as proof of concept rather than to develop a complete system. In addition, this research has considered the first stage of consecutive investigation of the social layer concept and does not imply its full implementation due to issues regarding time and complexity.
The reasons to use prototyping approach were the exploratory nature of this research and the need to show stakeholders a working solution at the end of the research. Our specific research focus is on prototyping to help understand the requirements of a potentially useful solution in the context of health advice-giving.

The development of the features were split into several coding experiments, one for each service feature. A rapid prototyping approach was used for developing these features, but with one distinction. The developed features were not left as is usually done while using rapid prototyping. Our aim was to use the main advantages of this approach - speed, as well as the fact that the cost of changing requirements is very low.

4.1.2 Use cases

The creation of use cases is used to describe and present the medical advice-giving process as a sequence of actions in text form. This leads to identifying potential functional features of web service by analyzing use cases through multiple iterations. Use cases were chosen because they do not require much time to write and are easy to edit, making them convenient to work with. Users were not involved in use cases creation.

The approach to functions development comprises:
– Writing use cases to describe the interaction between the nurse and patient in the context of co-browsing;
– And analyzing and processing use cases in multiple discussion sessions.

The purpose of these sessions is to:
– Work out all the scenarios of interaction and to identify features that are essential for medical advice-giving with regard to co-browsing;
– Identify the key functionality required for this process;
– Determine features that are nice to have;
– Highlight all key functions;
– Give arguments as why these functions are the key.

Use cases results describe the service features. The service features include creating yellow markers and red frame markers, focusing on markers, the animation of markers, and deleting yellow markers and red frame markers. All the features are divided into either implemented or not implemented in the prototype. The exact feature implementation status will be presented at the end of the section.
Some very important statements were derived during the refining/creating of use cases with regard to medical advice-giving. These statements are presented in Table 3 below:

Table 3. Use cases result statements

<table>
<thead>
<tr>
<th>Statement</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>The patient and the nurse should look at one and the same thing on the screen during the advice-giving process</td>
<td>Seeing the same information is an important criterion in supporting focus. It is argued that it ’is useless to focus on the information content that the user does not see at the same moment.</td>
</tr>
<tr>
<td>Quick establishment of the co-browsing session</td>
<td>This important performance criterion was mentioned during an interview at 1177. It was stated that the duration of the advice-giving session should not be affected by technology type.</td>
</tr>
</tbody>
</table>

Based on the discussion, such features were proposed for the design of the service. They are described in Table 4 below:

Table 4. Proposed service features

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Focusing on a selected area of the screen</td>
<td>One of the goals was to find a technology solution that would allow the user to focus on a particular text content (not implemented).</td>
</tr>
<tr>
<td>Centring on a visible area of the screen</td>
<td>The nurse scrolls the screen by the side of the patient (not implemented).</td>
</tr>
<tr>
<td>Centring on markers</td>
<td>The same thing, only implemented for a specific marker (implemented).</td>
</tr>
<tr>
<td>Indicators of the patient’s visibility markers</td>
<td>Such visual interface elements and an attached functionality that allow the transfer of information on the location of the markers on the patient side (implemented).</td>
</tr>
<tr>
<td>Stored markers</td>
<td>The ability to save web page-displayed markers as jpg and png images (not implemented).</td>
</tr>
</tbody>
</table>
4.1.3 Design of web marking tool features

The intention to offer a stronger explanatory power to online health advising gave rise to the design of web marking tool. This concept emerged during an interview with the manager of the 1177 telephone service (Interview with 1177 Kalmar staff. 3 April 2013).

Explanatory power is a characteristic that increases the recipient’s perception of information, distinguishing primary things from the secondary, and the detailed explanation of health advice in order to sustain this in the recipient’s memory.

This characteristic is important in scenarios that require the explanation of specific information from the web sources. We give a description of such a scenario in order to bring clarity.

1. Advice seeker dials the service and he/she asks for specific advice or assistance.
2. The nurse (adviser) in such a case conducts a detailed survey and clarifies the current situation of the advice seeker and the reasons that led to it.
3. The nurse may suggest the use of self-help techniques and mutual medical aid. Typically, the nurse uses a website of 1177 to explain these techniques (Interview with 1177 Kalmar staff. 3 April 2013).
4. During the process of explanation, the nurse reads the information from the information support system and maintains a telephone conversation.
5. In turn, the advice seeker is able to listen only (during this time), which clearly illustrates the limitations of phone technology. This was mentioned during an interview with the manager of the 1177 Kalmar department. The 1177 manager said that it was always difficult to explain medical information and be fully confident that the advice seeker had understood what was said (Interview with 1177 Kalmar staff. 3 April 2013).
6. During the communication process, the nurse may advise the use of the 1177 website later, and if the advice seeker has any additional questions, he/she may call again as well.

Co-browsing surfing of the web was chosen as solution that will complement the telephone discussion of the medical information on the web. Co-browsing allows two users to simultaneously reside on the same web page, and view or affect the same content, and, most importantly, clearly understanding the web page’s content. This is an important factor in achieving the most explanatory power.

Besides the co-location of the adviser and advice seeker on the same web page, it is also important for the adviser to be able to emphasize the key information and allocate/focus on the important things. This can be achieved by increasing the preciseness of content on web page. So the first feature of such a tool is to mark the content on the web page during the cross-browsing session.
Let us consider an opportunity to mark information on the web page. This is usually done by a marker pen to make the text yellow on a white background. In other words, a marker that clearly distinguishes the text on a web page should be among the nurse’s arsenal of tools. The marked text will be clearly highlighted and therefore will draw the attention of the advice seeker. Since some pages may have a different background, markers can be done in different colours. Ability to mark out a section of text help emphasize the key information and focus on the important things (see Figure 3).
An extra sample of paper mocks of web page with markers is given in Appendix B. It gives a brief demonstration of the web page screens with markers that we have developed after the use cases design stage of the research work.

The web page can have any number of markers (within a block of text), which could be either a single word in a sentence, a whole sentence, or the whole paragraph. The marked text clearly indicates to the service user that it is necessary to pay attention. The next feature is the concept of focusing.

‘Focusing’ refers to forcing the user’s attention on a specific marker that is drawn on the web page. It may be needed during advice-giving to display a certain marker and make it stand out since web pages can take several monitor screens and may require a rapid shift of the screen to display the marker. The process of focusing may be accompanied by scrolling the page if the marker is not visible to the user. This activity only be used by the nurse.

Focusing on one specific marker also includes an explicit highlighting of that marker from other markers on the page. This is to ensure that the user is clearly aware of which marker is referred to at that particular moment in the advice-giving session. Thus, the whole process of health advice-giving for this scenario would be to create markers that mark important information on a web page, display them to the user, and provide a consistent explanation of the information page by voice via telephone. It may be accompanied by focusing on markers one by one, if necessary. If the user needs a re-explanation, the repetition can be combined with a focus on a specific marker.

The markers have two states— focused and unfocused (default) state where markers can be single words, sentences, blocks of text, or paragraphs. We are using a two-level approach where a sequence of consecutive words of arbitrary length can be marked out and an arbitrary number of these markings can be grouped using a frame. The frame is a table block that covers a block of text with markers (see Figure 4).
To summarize, some important benefits of a frame are:
- It creates grouping of markers and there is no need of second-level markers; and
- It is a noticeable visual indicator;
- And it can be created within the user’s screen size.

The frame is an interface in which interactive and indicative elements can be placed. This is discussed below.

The visibility of the currently active frame as viewed by the client is continually monitored and a three-level indicator lets the advisor know if the frame is in view or not (see Figure 5). An indicator has three colours:
- Green, showing that the frame is fully visible to the user;
- Yellow, indicating partial visibility; and
- Red, which means that the frame is invisible to the user.
Figure 5. Frame visibility indicators on nurse side
Partial visibility refers to a situation when the page content requires several screen sizes of the user’s monitor and some part of the red frame is hidden due to the scrolled page (see Figure 6).

Figure 6. Red frame hidden due to scrolled page

It’s important here to present the way in which red frame and yellow markers increase the preciseness of content.

Yellow markers increase preciseness of content due to contrasting background that "presses out" the text to be contrasting both to the page background and the text background. Since both the web page and the text might be yellow or some low contrast color that always choosing yellow won't necessarily increase preciseness. However, as most web pages have whitish backgrounds and most texts are blackish, yellow usually works well.

We also need to take into account the mental model of how people typically mark text in documents, papers and magazines. Manual highlighting is usually is done by neon yellow marker pens.

The red frame, in turn, is a way to select a portion of text relating to a specific topic, which when activated sets the contextual framing for that segment of the conversation when the topic is discussed and that the yellow markers function is to dynamically guide attention to sub-topics in sync with the flow of the conversation.

Red frame’s contextual framing is used for advice explanation or expression and represents content that is exact and accurate for the patient’s case. This concludes our discussion of design features.
4.1.4 Difference between markers and static highlighting

Marking is presented as a complementary tool to voice-based health advice-giving which used for emphasizing important text in order to improve advice seeker understanding of the health advisory and to enhance opportunities to discuss health issues. Marking methods include both highlighting and framing, but can be extended by using additional methods to work or collaborate over content.

The highlighting of a text is a form of notation which serves to reinforce the text’s meaning. Notation is a set of visual cues used to improve the readability of highlighted text and allow it to be more easily understood. Highlighting does not change the actual meaning of text, but rather allows the meaning to be readily understood.

Highlighting provides a mechanism of communication and collaboration between the counsellor/adviser and the information seeker by emphasizing some important texts, according to Shen and Sun (2004). It is also necessary and valuable in multi-user collaborative environments (Shen & Sun, 2004).

Moreover, Shen and Sun (2004) have pointed out that highlighting may be used for other purposes like providing awareness hints. In dynamic advice-giving environment these awareness hints might trigger questions about information that the information seeker (he/she) needs.

In case of this research especially important to distinguish between static highlights (such as underlined sections in a highlighted hard-copy book) and the dynamic highlights (markers). The defining characteristic of our system is the markers are activated dynamically and which are represented by the synchronized speech and activation of markers.

The main purpose of the marking is to dynamically focus attention on specific content during telephone communication, and the use of marking for complex health advisory issues.
4.2 Development of web marking tools

As mentioned in section 3.2 Social layer architecture, by adding new modules to the social layer structure, we could enable new functionality, establish a new kind of application behaviour.

The marking module enables a marking functionality for social layer actors—namely, the marking of text and grouping of markers. It also allows exchange of information about what text (paragraph, sentence or word) is marked by the social layer actor (nurse and patient).

The overview of health advice-giving session and technical implementation of the functionality and related development issues will be presented in next sections.

4.2.1 Overview of health advice-giving session

The description of the typical or idealized progression of a health advice-giving session with web marking tools usage is illustrated by Figures 7 and 8.

1. The health advice-giving session starts on the phone when a patient dials the 1177 service and asks for specific advice or assistance from a nurse.
2. The nurse conducts a detailed survey and clarifies the current patient’s situation and the reasons that led to it. The health advice-giving session ends if the nurse is satisfied with the patient’s understanding of her instructions and the patient feels safe and secure. At this stage, the telephone-based health advice-giving session is complete.
3. The nurse may decide to use a marking tools in case the patient displays signs such as lack of experience, aversion to new technologies, uncertainty, difficulty in explaining in medical terms for his/her situation, difficulty in describing his/her symptoms, forgetfulness, and remembering sequences of actions where the order has an important role, etc.
4. The nurse asks the patient to open the 1177 website and enables a co-browsing session by entering a code or permission from the patient to enable co-browsing. The co-browsing session is activated by the nurse only on the 1177 website. It enables the marking functionality for the nurse web browser and she can start creating marks on the web page.
5. The nurse marks a certain part of the web page or text in it to explain techniques of self-help and mutual medical aid. During the explanation process, the nurse reads the information from the information support system and maintains a telephone conversation.
6. Markers data are transferred and then displayed on the patient web browser. The nurse continues to explain the medical instructions and advice.
7. Additional marks are created as many times as needed to explain the health advice case. The patient may ask additional questions, which in turn may lead to the continuation of the health advice-giving session. The session finally ends if the patient is satisfied with the results.
1. Ordinary health advice-giving

2. Nurse analyzing question

3. Nurse analyzing question

4. Nurse asks for co-browsing session

Figure 7. Progression of health advice-giving session (part 1)
5. Nurse creates mark to explain the answer

6. Mark is recreated on patient side and nurse explains the instructions

7. Additional marks are created and explained till end of session

Figure 8. Progression of health advice-giving session (part 2)
Marking tools screenshots presented below in Figures 9, 10. Marking tools demonstration can be viewed here [https://www.youtube.com/watch?v=E3UiZPRc98Q](https://www.youtube.com/watch?v=E3UiZPRc98Q).

Web page content marking occurs during telephone communication, which reflects our idea of a complementary function to voice-based advice-giving for the purpose of increasing the preciseness of web content and making use of the web as an information resource.

Figure 9. Screenshot of patient and nurse screens №1

Figure 10. Screenshot of patient and nurse screens №2
4.2.2 Technical implementation

This section presents technical implementation of the marking functionality namely, the marking of text (yellow marks) and grouping of markers (red frame), as well as discussion of markers reconstruction issue, markers visibility and focusing on red frame.

The marking functionality is implemented by means of client-side Javascript which provides markers creation, transferring, reconstruction and conformity check that markers cover the same content on nurse and patient sides.

Red frame

The red frame is a HTML `<div>` element that has a css property border equal red. To create red frame user needs to hold down the left mouse button and stretch to the area that he/she wants to select. The implementation supports the creation of multiple frames on the web page (see Figure 11).

![Two red frames screenshot](image)

To find out the exact area that was covered by a particular red frame we need to determine the exact position (coordinates) not only of all the elements on the web page (nodes in the DOM tree) that are covered by the red frame, but also the content of these nodes—namely, each letter in each word in all the visible nodes on the web page.
The positions of all the text signs on the web page are determined by means of JavaScript API method called `getBoundingClientRect()`. This method was used to retrieve the coordinates of the particular DOM node on the web page.

In our case problem was to determine the position/coordinates of the text elements (signs) inside the node DOM element. For these purposes, the `Range` interface was used to create the range selection object of the letter (text sign) on the web page and then applied `getBoundingClientRect()` method to this `range object` to determine it coordinates.

In prototype `range objects` created for all text signs that are covered by the red frame and coordinates of all text signs were determined.

Knowing the coordinates of all the text signs of all text elements on the web page, we compare them with the coordinates of the `mouse-down` and `mouse-up` events of red frame creation. Using this comparison, we find out the exact area that was covered by a particular red frame. Then, this data is transferred to the patient side in order to reconstruct the red frame.
**Yellow marks**

Yellow marks are DOM text nodes wrapped in HTML span tag that has the `css` property `background-colour` set to yellow (see Figure 12).

Yellow marks created through the mouse selection of text. As in the case with the red frame, the `Range` interface was used for the yellow markers’ creation as well. The principle is that when the user selects the text, `range object` is created with the text selected by the user.

Then this text extracted from the `range object` and the selected nodes. A separate search function found this text on the web page and marks the selected text by wrapping it in a yellow span tag.

![Figure 12. Red frame with yellow marks screenshot](image-url)
Markers reconstruction

One of the technical implementation problems was the reconstruction of markers on the patient side to cover the same content as on the nurse side. For this purpose, the data about which nodes in the DOM tree were selected should be the same on both sides and; therefore, a verification of the transferring data is needed.

Hash sum was used to check for mismatches (see Figure 13). Since the DOM tree structure is used to describe segments of text, any differences between the tree structures due to, for example differences between web browsers how they construct DOM trees from the source code (HTML), can be caught.

Hash sum for a selected node is created on the nurse side, and then these hash sum data are sent to the patient side with the use of the messaging system. On the side of the patient, a hash sum is created for selected nodes and compared with the hash sum data sent (by the same algorithm).

The hash sums are verified and markers are created on the patient side if they are the same. If the hash sums are not the same, a discrepancy message is displayed on the screen. The hash sum description created for a seminar with Martin Östlund and his colleagues is given below.

Figure 13. The resulting description of hash sum determination
It considered a fail-safe way to make sure that the right text is indeed selected on the other side (as a mismatch of this kind can be very dangerous if the advisor thinks a certain text is selected while really another is selected if the wrong dosage instruction where to be selected for instance).

There is another important issue regarding the reconstruction of the markers, which deals with the problem of different screen sizes on the sides of the nurse and the patient. This limitation does not allow us to use the position coordinates of the markers (red frame or yellow markers) on the web page since it is obvious that if the screen sizes are different, then these coordinates will correspond to a completely different position on another screen.

To reconstruct the markers Range interface was used. Let us describe this principle with an example. For instance, we have to send data about the text area that is covered by the red frame in Figure 14 (text frame covered text).

Marked red letters define on what elements two range objects will be created. These two range objects frame this block of text. The first range object is created in text block of first text element of selected frame, and a second range object is created for last letter in text block.

Then properties of these two range objects (range.startOffset shift, range.endOffset shift, DOM startNode and endNode nodes) are sent to the patient side, and range objects are created by means of document.createRange() method on patient side.

Reconstruction of this range objects on patient side gives ability to apply getOffsetRect() method to determine the coordinates of these range objects, but on the side of the patient for this device and screen size. Using such pair of range objects we determine positions of any area of text on the screen web page.

For the reconstruction of yellow marks on the patient side, we send only one range object that represents the yellow mark itself.

Figure 14. Range objects usage for definition of covered text
Visibility markers

Visibility markers contain information about the visibility of red frames on the patient side—namely, the parameters that indicate whether the red frame is visible on the screen area (see Figure 15).

![Red Frame No1 and No2](image)

Figure 15. Patient red frame visibility in percentage on nurse side

A visibility marker is determined by comparing the position of red frame coordinates with the coordinates of the visible screen area when the patient scrolls the web page. Then, values of visibility markers sent to the nurse side and displayed on the panel in the form of coloured text, where 100% visibility is shown in green and 0% visibility in red. In between, the visibility markers on the boundary points are displayed in gradations between red and green.

Red frame visibility markers were implemented in the current version of the web service prototype.

Focusing on a selected red frame

Forced scrolling of the patient’s screen to a particular red frame is implemented using Javascript `window.scrollTo` function.
4.3 Summary

This chapter presented design and development process of web marking tools for online health counselling domain.

The prototyping methodology was chosen for the development process of the service presented in this thesis. The use cases methodology was used to describe the interaction between the nurse and the patient in the context of co-browsing, to work out all the scenarios of interaction and to identify features that are essential for medical advice-giving with regard to co-browsing.

Yellow markers and red frame features were proposed to emphasize the key information and allocate/focus on the important things during health advice giving session. This is achieved by increasing the preciseness of content on web page due to contrasting background that "presses out" the text to be contrasting both to the page background and the text background. In turn red frame is used for explanation and represents content that is exact and accurate for the patient’s case. In addition the 'focusing' feature was proposed to forcing the user’s attention on a specific marker on the web page.

The defining characteristic of web marking tools is the dynamic nature of markers that are added/activated dynamically during synchronized speech.

Development of web marking tools section provided overview of health advice-giving session and technical implementation of the marking functionality, namely, yellow marks and red frame, as well as a link to marking tools demonstration and discussion of the markers reconstruction issue.

For the purpose of reconstruction and conformity check that markers cover the same content on nurse and patient sides DOM tree nodes hashing and the Range interface was used. Finally the implementation of focusing on selected frame and visibility markers features was presented.
5 EVALUATION OF WEB MARKING TOOLS FOR ONLINE HEALTH COUNSELLING

The chapter contains method and description of the experiment design for web marking tools evaluation. It also describes the results obtained during the experiment and participants comments, and this is followed by the discussion chapter.

5.1 Method

An experimental user study was set up to test the prototype version of the marking tools application. The purpose of the study was to evaluate a sample of participants’ standpoints about the marking tools application as a complementary service for voice-based medical advice-giving, and to specifically explore the issue of the potential usefulness of web marking tools in this setting.

Answering the research question requires drawing conclusions about the potential usefulness of the marking tools. This, in turn, requires the evaluation of the marking tools during the health advice-giving session with 1177 users in an experimental setting. An investigation of the interaction between the nurse and the patient is needed to figure out the positive and negative characteristics of the marking tools.

Additionally, the web marking tools was assessed from a professional perspective that is regarding how a professional is using it and how suitable it is for nurses’ health counselling purposes. A user group was also used to propose potential features for improvement and express the group’s opinion about the usefulness of the marking tools.

Objectives

- Evaluate web marking tools with user group
- Investigate the interaction between the nurse and the patient
- Evaluate how the web marking tool is used by the nurse
- Suggest potential features for improvement

For this study, it was important that the participants of the target user group were native Swedish speakers. The experiment was conducted at the 1177 organization’s Kalmar department on November 30th 2013. The experiment was conducted in collaboration with the 1177 healthcare advice organization, where the nurses know various languages.

However, for this particular experiment, we recruited only Swedish-speaking participants to exclude the language communication limitation between the nurses and the participants. Therefore, the participants were 5 students and one faculty member of Linnaeus University.
The participant range was limited with regard to age, backgrounds, and interests. Six people (two women and four men) were recruited with ages ranging from 21 to 37, and they consisted of one assistant professor, one web developer, students from web programming, interaction design courses as well as from other non-software programming courses.

The role of the adviser was played by a nurse (Gunilla Gustavsson) from 1177’s Kalmar office. As a member staff of 1177, she has the professional qualification to give valid medical advice and many years experience of conducting telephone-based medical advice-giving.

The trial was recorded, but the recordings were used only the to analyse the interactions between the participants and the adviser. No information about the sessions was stored in systems of the 1177 department. The recordings included sound and screen recordings of both types of sessions.

5.1.1 Experiment description

The participants assumed the role of a concerned relative of a child who required medical assistance or advice and they were instructed to try to find out how they could help the child. It was about describing a situation involving a sick person (who is someone other than the participant) and where the participant needed to find out information on how he/she should act in the situation. Each participant had received a letter several days in advance that described his/her role and the health issue or situation.

Each participant described and asked questions about this health situation to the nurse independently. Topics about health issues were also sent to the participants a couple of days before the experiment.

The topics were about two health issues or situations: The child was coughing or the child was vomiting. The participants were willing to add any additional symptoms available in the topic description. The topics are presented below:

**Topic # 1**

Your sister/brother has asked you to babysit for his/her four-year-old boy/girl. After a while, the child becomes sick and starts vomiting. You do not know what he/she has eaten earlier in the day and you are unable to contact the parent. You turn to 1177 for help and wait to be called back by the nurse to describe the situation.

You can include additional symptoms such as:

1) abdominal pain
2) unusual/new diet
3) headache
4) the child seems nervous
**Topic # 2**

Your sister/brother has asked you to babysit for his/her four-year-old boy/girl. After a while, the child becomes sick and starts coughing badly. You do not know if the child had felt poor earlier in the day and you are unable to contact the parent. You turn to 1177 for help and wait to be called back by the nurse.

You can include additional symptoms such as:

1) dry cough
2) fatigue
3) bad mood
4) cough worsened during physical activity

Each participant participated in two advice-giving sessions of a maximum of seven minutes, first using the telephone with one type of medical advice question (for instance, Topic 1) and then using telephone + web + web marking tools with the other topic (for instance, Topic 2). The order of starting the session (start with telephone or start with telephone + tool) was randomly determined. In both cases, the session was initiated by the nurse at a predefined time.

The participants had to be reached via telephone and online for the specified time. Also, they had to have internet-connected computers with the Google Chrome browser installed, although some participants used the Safari browser in the experiment. The approximate call times were sent to the participants before the experiment. For each session (only telephone/telephone + utility), the participants got a description of the questions that they should ask and the role that they should play.

At the time of the experiment, the nurse was present at her everyday workplace, which included work station with the information support system and the Chrome web browser open on a laptop. The website with co-browsing session was set up and configured before the experiment.

The nurse was at her place of work using the practice station that was set up exactly as the general working station. The general working station included one/two office tables, a PC with two monitors, headphones with a microphone, several office chairs, and cabinets with shelves located in a separate room. The experimental setting is presented in Table 5.

The PC has the Windows 7 operating system with no extra enhancements/upgrades, and the web browsers are Google Chrome and IE 8 with no upgrades or plugins. The recordings of the experiment were conducted at the nurse’s workplace. Recordings of the PC screen and audio of the health advice-giving sessions were made. The participants phoned from a distance, either from their homes or other locations (school/library/work). All of them were in different locations (non-co-located).
Table 5. Experimental setting

<table>
<thead>
<tr>
<th>Nurse</th>
<th>Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>PC station with information support system + laptop with web browser</td>
<td>Telephone + PC/laptop with web browser or Smartphone with mobile web browser</td>
</tr>
</tbody>
</table>

The telephone was used in this study to provide a point of reference for the participants with the help of which experience of the marking tool can be compared and also as a comparative reference (standard) in the evaluation of the marking tools. Two days after the telephone sessions, the participants were asked to evaluate both types of sessions through an online questionnaire survey form. The reason the survey was sent out two days later was to give participants time to think over and to process experience obtained during experiment. The questionnaire is presented in Appendix C.

The questionnaire covered the following areas:

- Demographic data – gender and age
- Name (optional)
- Occupation (optional)
- Comparisons between telephone and telephone + web + marking tools (evaluation from 1 point to 5 points). The listed comparative parameters were: 1) user-friendly; 2) easy to communicate; 3) sense of personal contact; 4) explanation power; 5) confidence building; and 6) effectiveness. For each of these parameters, the participants were asked to add brief explanations (two to three sentences) of their assessments.
- These included suggestions about improvements, satisfaction level, and attitude towards possible functionality adjustment.

The nurse also participated in 10–15 minutes of a telephone interview during which she was asked questions about the usefulness of such a tool, possible tool improvements, and a general impression about the tool.
The case study materials are given in Appendix D. The experimental design is summarized in Table 6 below:

Table 6. Experiment description

<table>
<thead>
<tr>
<th>Participants:</th>
<th>One licensed medical nurse advisor (1 woman) and 6 ‘ordinary people’ (2 women and 4 men) in the role of advice seekers.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Procedure:</td>
<td>Telephone setting: The participants assumed the role of a concerned relative and they were instructed to try to find out how they could help a child who required medical assistance or advice for two situations: Coughing and vomiting. Telephone + web + marking tool setting: The participants again played the role of a concerned relative and were instructed to try to find out how they could help a child who required medical assistance or advice for the same two situations.</td>
</tr>
<tr>
<td>Data collection:</td>
<td>Screen recordings (nurse’s screen), audio recordings (all calls made during experiment), survey of participants, and semi-structured interview with the nurse.</td>
</tr>
</tbody>
</table>
5.2 Results

The first thing we can briefly mention is that it seemed that the attitude to the tool depended on the attitude towards web technologies in general. Those participants with prior experience in web programming, interaction design, or who were exposed to them in their everyday life, easily identified the instrument’s potential, even at the first glance and seeing it in action only once. In contrast, those participants who did not have such prior experience in general complained about excessive functionality of the product.

Almost all the participants were in favour of getting more control of the tool, which included the ability to create markers or focus on a particular screen area. The ability to store session history was also evaluated positively.

The participants evaluated the telephone as being a more user-friendly way of communication, and this can be due to their being accustomed with to telephone communication and may be also to advice-giving over the telephone. The participants evaluated the telephone as an easier way to communicate than the combination of telephone + web + marking tools.

The evaluation of the sense of personal contacts on the average showed the same results. An explanation can be that marks raised the preciseness of the web content. Next, telephone communication was evaluated as building more confidence than the complementary telephone + web + web marking tools. This may again be due to being habituated to telephone communication. The effectiveness was evaluated highly for both types of advice-giving sessions, with a slightly higher value given to telephone + web + web marking tools.

In general, the participants stated that the markers easily drew attention to themselves, and they clearly stood out against content that were not marked. This ease of use and attention drawing capacity were nice features that we designed for and were pleased to see that it worked out. The users expressed that they felt it was easy to keep up with the current focus of attention and in some cases, the participants even referred to excessive attention-bringing as it allowed the nurse to accurately point out key information (symptoms, dosage, number of hours, the sequence of actions of common content), which we assume may bring in more confidence for the patient in learning/remembering information.

Another positive comment about the co-browsing approach was that the web provided the ability to read medical information from the screen. We can add that the advice seeker could not only read, but the presence of a nurse gave him/her the opportunity to clarify what was unclear and the availability of tools allowed the patient’s relative to pay attention to the important things.
The features to improve the web marking tools service were proposed on the basis of the participants’ standpoints. Such features were proposed for service functionality expansion, among them: chat, markers saving, comments, and links to marked page. The potential areas of improvements are listed in Appendix E.

The participant stated that the marking tools added the ability to get a little more deeply into what moved the symptoms and on using information contained in the articles on the 1177 website. Moreover, they also mentioned that some questions wouldn't have been asked without the web because they were inspired or informed by what they could read on the screen. It enabled them to see information or detailed instructions and so they could immediately start asking questions to the nurse.
5.2.1 Results of evaluation form

The raw data of participant’s responses are given in Appendix F. Processed data of participant’s responses is given in Table 7. Sessions duration time of telephone and telephone + marking tools presented in Table 8.

Table 7. Results of evaluation form

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Type of setting</th>
<th>Arithmetic sum</th>
<th>Average rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>User-friendly</td>
<td>Telephone</td>
<td>25</td>
<td>4.17</td>
</tr>
<tr>
<td></td>
<td>Telephone + tool</td>
<td>24</td>
<td>4</td>
</tr>
<tr>
<td>Easy communication</td>
<td>Telephone</td>
<td>24</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Telephone + tool</td>
<td>22</td>
<td>3.67</td>
</tr>
<tr>
<td>Sense of personal contact</td>
<td>Telephone</td>
<td>23</td>
<td>3.83</td>
</tr>
<tr>
<td></td>
<td>Telephone + tool</td>
<td>23</td>
<td>3.83</td>
</tr>
<tr>
<td>Explanation power</td>
<td>Telephone</td>
<td>23</td>
<td>3.83</td>
</tr>
<tr>
<td></td>
<td>Telephone + tool</td>
<td>24</td>
<td>4</td>
</tr>
<tr>
<td>Confidence building</td>
<td>Telephone</td>
<td>24</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Telephone + tool</td>
<td>20</td>
<td>3.33</td>
</tr>
<tr>
<td>Effectiveness</td>
<td>Telephone</td>
<td>24</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Telephone + tool</td>
<td>25</td>
<td>4.17</td>
</tr>
</tbody>
</table>

Table 8. Sessions duration

<table>
<thead>
<tr>
<th>Participant number</th>
<th>Telephone session duration</th>
<th>Telephone + mark. tool session duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td>3 min</td>
<td>3 min</td>
</tr>
<tr>
<td>2nd</td>
<td>3 min</td>
<td>3 min</td>
</tr>
<tr>
<td>3rd</td>
<td>4 min</td>
<td>5 min</td>
</tr>
<tr>
<td>4th</td>
<td>4 min</td>
<td>6 min</td>
</tr>
<tr>
<td>5th</td>
<td>3 min</td>
<td>2 min</td>
</tr>
<tr>
<td>6th</td>
<td>7 min</td>
<td>11 min</td>
</tr>
<tr>
<td>Average time:</td>
<td>4 min</td>
<td>5 min</td>
</tr>
</tbody>
</table>
Time was also one evaluating criterion since it is an important factor that was discussed in the interviews and consultation during the development. The evaluation form results for all the participants can be retrieved by reference (Participants responses of evaluation form. 2013).

5.2.2 Participants comments

This section covers the free-text comments given by the patient participants. These responses are mainly suggestions about improvements, satisfaction level, and attitude towards possible functionality adjustments for the evaluated marking tool as a complementary service to medical telephone-based advice-giving.

– ‘Obtaining information on the phone was faster than the web. There are technical problems during the session.’

According to the participant’s point of view, he obtained information faster from the telephone conversation than the web. He also mentioned that there were some communication problems that were avoidable technical glitches during the experiment.

– ‘The nurse should have less control; she can only select only those parts of the page to which I will point.’

This participant advocated for limiting control of the nurse’s actions on the web, and suggested that the nurse should be able to select only certain parts of the web page to which she is directed.

– ‘It would be nice to use chat during the session.’

This participant proposed to use text chat in addition to the marking tools during the advice-giving session.

– ‘I had difficulties with web surfing; I want the ability to browse the web pages like the nurse.’

This participant reported that she had difficulties with web page browsing and proposed to have the ability to browse web pages like the nurse.

– ‘It was not difficult to use the web, but this extra step is unnecessary to cure the child.’

The participant noted that the tool was not difficult to use, but made a comment about the uselessness and excess of the marking tools.

– ‘It was easy to understand. Session was over-explanatory. It was a simple enough explanation for this case.’

This participant concluded that the use of marking tools on the web was over-explanatory in the cases that were used during the case study. It was stated that simple explanations would have been enough.
– ‘The web seemed like unnecessary hassle. I wanted to have personal contact with the nurse without any other distractions.’

The web was assessed as an unnecessary thing. Personal contact was chosen by the participant as the best way to solve medical issues. The web was considered distracting.

– ‘The ability to save markers, returning to them later, comments for markers.’

The participant proposed an objectively useful scenario to implement features that would save markers, giving the option to return to them later. Also, commenting on markers was mentioned as possibly useful.

– ‘Marks are easy to keep up with.’

This participant reported that the marks were easy to keep up with during the health advice-giving session. It clearly draws attention to the content that was framed on the web page.

– ‘Very easy to forget things over the phone, as opposed to the web where you can read everything.’

The participant stated that the use of the web provided the opportunity to read all the needed medical information as opposed to the phone, where it is easy to forget things.

– ‘To use this service in everyday practice, you must pay attention to security and safety issues.’

The nurse stated that security and safety issues were very important for further development of the service.

– ‘I would highly recommend the use of this marking tool for all my colleagues.’

The nurse highly commended the service and said that she would recommend the marking tools for her colleagues.
The discussion of the participants’ responses will be conducted in the next section. The useful points from the evaluation form are summarized in Table 9 given below.

Table 9. List of points of usefulness

<table>
<thead>
<tr>
<th>Patient side</th>
<th>Nurse’s side</th>
</tr>
</thead>
<tbody>
<tr>
<td>– Focus attention</td>
<td>– Frame the important and key information</td>
</tr>
<tr>
<td>– Frame instructions</td>
<td>– Fast browsing from one page to another, fast content/topics presentation</td>
</tr>
<tr>
<td>– Clear highlighting</td>
<td>– Increase in preciseness</td>
</tr>
<tr>
<td>– Perception of more precise information</td>
<td>– Force screen change to focus on specific marker</td>
</tr>
<tr>
<td>– Lower possibility to forget</td>
<td>– Not a session of long duration as compared to the telephone</td>
</tr>
<tr>
<td>– Fast browsing from one page to another, fast content/topics presentation</td>
<td>– Can be used in cases not allowed in an ordinary telephone session</td>
</tr>
<tr>
<td>– Advice-giving discussion expanding</td>
<td></td>
</tr>
<tr>
<td>– More personal, concrete information (comments on marks)</td>
<td></td>
</tr>
</tbody>
</table>
This chapter includes 6.1 Potential usefulness of web marking tools to health counselling section which presents the analysis of the experimental results in the context of medical advice-giving setting with regard to the mentioned definition of usefulness.

Then followed by analysis of web marking tools application with regard to the complexity of health counselling issues in 6.2 Web marking tools application for complex health counselling issues section.

6.1 Potential usefulness of web marking tools to health counselling

The analysis of the experimental results will be presented in the context of medical advice-giving setting with regard to the mentioned definition of usefulness in section 1.3 Terms and definitions.

The potential usefulness of certain features of the service may differ from its actual usefulness because the perceived usefulness is based on the experiences and perceptions of a person. In other words, it exists in a person’s consciousness. Our discussed views about the potential usefulness of the service may differ from the participants’ opinions presented in the results.

It is also important to mention that we discuss different aspects of usefulness by way of the data that we actually have, but the data came from a small-scale study and should, therefore, be considered tentative. For those points where there is no empirical data, we can say that their discussion is grounded on things that were learned by designing, implementing, and trying out the service prototype.

First, it is important to mention such a statement from the terms and definitions section. Something is recognized as useful if it:

a) Meets someone’s interests;

b) Ensures/supports achievement of goals; and

c) Lets one to do things with the lowest cost (contributes to efficiency).

We should also remember that the nurses have a specific role and specific responsibilities tied to that role. They have to make sure that the patient:

1a) has the information he/she needs,

1b) understands it,

1c) is motivated to act in accordance with it;

and that the patient:

2a) feels safe and secure, and

2b) feels confident.
**Point a) Meet someone’s interests**

1a) **Patient has the information he/she needs.**

In the case of telephone advice-giving, the information seeker is restricted to spoken content. He/she can only memorize it or write down the nurse advice during voice-based communication.

In the case of a web marking tool as a complementary feature to telephone-based advice-giving, the information seeker has the web to focus on content related to the advice itself and also has contexts about other information.

Here, the important role belongs to markers. Viewing the web page without markers and having a telephone conversation makes no difference as compared to a telephone-only conversation. However, when we have the marks on the web page, they focus attention on relevant content and provide hints. These hints might trigger questions about information that the information seeker (he/she) needs. With a telephone-only setting, there are no such hints.

Additionally, one of the participants pointed out that using web pages with marking tools gives expanded opportunities to discuss health issues that might lead to discussing information that he/she needs.

1b) **Patient understands it.**

The explanatory power of telephone + marking tools was rated slightly higher than the telephone-only setting. Three participants rated it with the grade ‘4’ and two rated it as ‘5’. Only one participant rated it with grade ‘2’, asserting that the session was over-explanatory. Taking into account the fact that the session was conducted with the help of a marking tool, such an assertion can be seen as being positive. On the other hand, three participants rated the explanatory power of the telephone setting with grade ‘3’ and two rated it as ‘5’.

Based on empirical data of the research we cannot state that web marking tools may contribute to patient’s understanding of medical advice. Statement of this kind requires more in-depth study and larger sample group of participants. It can be also noted that it is nurse responsibility to make sure that patient noticed marked content and fully understands information he/she needs. Therefore, we can state that web marking tools can ensure that certain health advice information will be marked as important and noticed by the patient.

According to the experiment results participant’s stated that they felt it was easy to keep up with current focus and markers clearly drew attention to the relevant content that was framed on the web page and in some cases, the participants even referred to excessive attention-bringing as it allowed the nurse to accurately point out key information (symptoms, dosage, number of hours, the sequence of actions of common content).
Additionally web marking tools provide a written record, thus allowing the advice seeker not to memorize everything. In other words, it offloads demand on his/her memory and frees the advice seeker’s cognitive resources from memorizing and instead allows to focus attention to health advice content.

On the other hand, the telephone does not provide visual attention drawing to written records and the advice seeker is required to memorize what the nurse told him/her. It can be eased through taking written notes, but that also means an extra step.

In case of the web and marking tools setting, the patient confirmed that it was easy to understand the medical advice because it was not very complex. This is true because simple health-related issues were used in the experiment. This was because we wanted to check the usefulness of the web marking tools in general and not to deepen the experiment’s design for more complex health issues.

In comparison to the telephone-only setting, the contribution of the marking tools in the understanding process should appear only in the resolution of more complex health issues and its benefit would be greater in not so simple health-related situations.

1c) Patient is motivated to act in accordance with it.

Medical advice-giving provide a professional opinion about what a particular individual should or should not do to improve his/her health. Taking this into account, we can state that the motivation in an advice-giving setting comes from the information itself. Armed with this statement, we compared two different approaches to health advice-giving with regard to its possibilities in its contribution for motivating the patient.

In the telephone setting, the patient has only one source of trusted information, namely, the nurse. With web marking tools setting on the other hand, an advice seeker has two trusted sources complementary to telephone communication: the nurse and specific marked content on the web page.

In addition, during an advice-giving session, it is the nurse’s responsibility to select what is relevant to the individual by using the marking tools to make general information on the web page to more specific for the patient. This should lead to more productive collaboration over the content and, thereby, build up trust.

Our point here is that trust could benefit motivation, and this directly make the patient to act in accordance with the nurse’s medical advice and instructions in order to optimize his/her state of health and minimize negative influences on it.
Another point to build up trust is to give more control of the tool to the patient side. This choice gives freedom to the patient to create any type of marker in any situation or focus on a particular screen area, providing the nurse with a more detailed or powerful description of his/her health issue.

With more control over web marking tools patient can obtain more control over health advice-giving process in general and, thus, build up trust.

This statement supported by results where almost all the participants were in favour of getting more control over the health advice-giving process and even one participant proposed to choose which features to give to the nurse.

In the experimental setting, this question was not evaluated, but it can be used for further investigation of how the use of web marking tools for collaboration over content can build trust in medical advice-giving setting and raise patient motivation.

2a) Patient feels safe and secure.

Another option that could benefit a participant’s feeling of safety is a user-friendly parameter. The telephone-only setting’s user friendliness was evaluated slightly higher than the telephone + tool scenario with an average rating of 4.17. Three grades of ‘5’, two grades of ‘4’, and one grade of ‘3’ were given to telephone setting. On the other hand, the telephone + marking tools setting was predominated by grade ‘4’. This grade was rated four times. In general, we can state that the user-friendliness of the telephone + tool did not decrease significantly with the presence of the marking tools itself.

A comparison of the two advice-giving settings with regard to security and safety issues would tell us that, in the current state, the telephone setting is more secure and safe for medical advice-giving than a web-based setting. Security protection with web setting was not implemented due to the focus of this research on the web marking tools usefulness for health advice-giving service rather than on additional features of the service.

Even then, this issue was discussed multiple times during several research stages. For instance, the nurse, who participated in the experiment, pointed out during the interview that security issues were very important when it came to medical information, and that is why it was necessary to implement security protection in future versions of the service. In the tool itself, security protection was not implemented, but it could be integrated with the help of certain medical security protection frameworks approved by Swedish authorities.
2b) Patient feels confident.

The confidence parameter for the telephone setting was rated higher than for the telephone + tool with an average rating of 4. Two participants rated telephone + tool with grade ‘2’, which was the lowest grade received for confidence evaluation. On the other hand, the telephone setting received higher grades with two participants rating it with grade ‘5’ and two others rating it as ‘4’.

From the sample of the participants’ results, we can state that the participants’ evaluation of confidence on the marking tools and the co-browsing approach in general may depend on the attitude to web technologies. Therefore, the tool could be used for patients with a positive attitude towards web technologies.

Telephone advice-giving was evaluated highly. In contrast, the marking tools and co-browsing approach were evaluated low by the participants. This can be due to the experimental setting, the lack of control of marking features by participants, and confusion or unfamiliarity with the co-browsing approach. Despite all possible reasons, this defines a new problem of how to increase confidence building. Especially, among participants whose attitude to web technologies is low or negative.

This issue requires careful and precise analysis of all possible reasons of low confidence building and it must be examined in the course of further research. One of the propositions for this point is to set up an experiment in which participants could try this service more than once or over a period of time to avoid the initial astonishment with the service.

Point b) Ensure/support goal achievement.

Ease of communication is important in ensuring the goal achievement of medical counselling. Let us consider the ratings on the ease of communication with telephone and telephone + tool.

The telephone-only setting was rated slightly higher than the telephone + tool scenario with an average rating of 4. This can be due to the habitualness of telephone communication and the prominence of the 1177 service as well.

On the other hand, telephone + tool received three grades of ‘4’ and one each of the other grades (one grade for ‘2’, one for ‘3’, and one for ‘5’). Such a difference compared to the telephone may be explained by the presence of two sources of trusted information, the nurse and the web page, during the health advice-giving session. Having two sources of trusted information may confuse the advice seeker. Finding out how to increase the ease of communication in health-advice setting with two trusted sources can be used for further investigation.
Achieving the goals of medical counselling is done by providing certain information (instructions/explanations) by a nurse to a patient, who must absorb this information and act in accordance with it. So what contributes to the perception of information, and its transmission? The extension of this exchange of information ensures that the objectives of medical counselling will be achieved.

Web marking tools in a co-browsing setting allows the effectuation of providing counselling for those issues that have been banned from telephone counselling, issues that have been deemed too complex or too risky to handle over the telephone due to the lack of preciseness of telephone counselling, where there is the need to express accurate consequent lists of medical instructions. This tool provides the ability to operate within such situations, and this is obviously in the interests of 1177 health counselling service.

These justifications show that such functionality ensures the achievement of medical counselling goals and, therefore, brings benefits to their achievement. The results of the experiment with the service participants revealed that the tool can help extend communication between the patient and nurse, a consideration that may be beneficial in certain situations.

**Point c) - Allows you to do things at the lowest cost (promotes efficiency).**

The participants evaluated the effectiveness of telephone + tool a bit more than telephone only with an average rating of 4.17. Two participants gave the grade “5” to telephone + tool and four participants gave grade ‘4’. On their part, the grade values of the telephone setting were distributed evenly, with every two participants giving ‘3’, ‘4’, and ‘5’ grades respectively. In addition, the grade value of ‘3’ was more common in the telephone setting.

In general, most of the participants rated telephone + tool with higher grades than average. Each session was recorded and the time difference was less than one minute between two types of sessions (only in one case it was more because the participant wanted to know more information and this was reflected in his comments).

Even taking into account certain technical problems, the telephone + tool session were apparently not significantly longer than the telephone session (a difference of 1 min – 2 min is not significant) while the average stated time per session was chosen as seven minutes, and only one participant exceeded it because of his curiosity.

This may mean that the service is only a little less efficient or has almost the same efficiency with regard to time taken. It must be pointed out here that in more complex health advisory situations, increasing the time of counselling is a good thing because the patient can obtain more useful information.
6.2 Web marking tools application for complex health counselling issues

First, we must admit that the issue of complexity in counselling is a parameter that is not uniquely identifiable. Due to lack of knowledge and skills of the patient, he/she cannot expect unintended consequences. Therefore, complex situations can seem to be simple for advice seekers and vice versa. That is why in certain cases there is the need to apply more complex explanations for the patient even if the situation seems obvious and simple. The nurse should always keep in mind the current situation and apply more relevant methods for each concrete level of complexity of the medical advice-giving situation.

The participants reported that the use of web marking tools did not cause difficulties to them during the advice-giving session. At the same time, several participants stated that these marking actions were an unnecessary and extra step. In this case, we need to consider the process of counselling from the nurse’s professional perspective since only the advice giver can determine whether to use the tool or not. If a telephone explanation becomes insufficient at some point of the conversation and there is the need to use marking tools, the nurse can start the advice-giving session on the web and use marking tools or other service features.

As part of the experiment, a pair of cases was used: a child’s cough + additional symptoms; the dehydration of a child + additional symptoms. Both cases were not complicated at first glance, but an interview in the 1177 service reported a case of dehydration of a child when telephone counselling led to the negative effects on the child’s health (real case). Though the specific reasons for the adverse result were not discussed, but this case led to a ban on counselling on a particular question over the phone (Interview with 1177 Kalmar staff. April 3, 2013).

In turn, the participants did not know about this case because we did not set goals to affect the results of the experiment and the opinions of the participants. In that case, a simple question asked during the telephone conversation led to negative consequences. That is why we should identify the difference in the experience of the participants in the experiment, who were not faced with a situation where a simple case could lead to negative consequences, or the same experience that happened with their friends or relatives.

In turn, the nurse has extensive experience and has faced many situations, both simple and complex that have led to negative, unusual, unpredictable consequences and the patient required further treatment from a specific doctor. If we take the example of dehydration of a child, the need was to explain the sequence of actions (rather simple). In the case of medical counselling, it is better to take ‘extra’ steps than avoid them, but then everything depends on the context of the situation and the nurse’s choices.
7 CONCLUSIONS

We have explored the use of the social layer concept with a combination of telephone-based health advice-giving and the dynamic marking of shared web pages in the domain of health counselling. A prototyping approach was used to create and test a prototype to evaluate the potential usefulness of web marking tools. The prototype was evaluated on the following parameters: user-friendliness, easy communication, a sense of personal contact, explanation power, confidence building, and effectiveness.

The prototype was also used to explore specific characteristics of dynamic web marking, including: attention guidance, raising explanatory power, and willingness to follow given advice.

Dynamic web marking allows for accurate and timely identification and indication of key information content; raises the explanatory power by guiding the recipient's focus; increases receptiveness for advice and willingness to follow given advice and instructions.

Enhanced capability for attention guidance is useful guiding the recipient's focus towards key elements of the medical advice presented on shared web pages, including symptoms, medicine dosage, usage instructions and recommendations, description of exceptional situations, and presentation of images and other pictorial content. Raising explanatory power enhances the adviser's ability to relay medical advice and treatment and usage instructions in a clear and understandable way.

Based on the assembled empirical data we can confidently state that dynamic markings help clients focus on relevant information. It was shown that web markings were perceived to increase the explanatory power as compared to a voice-only setting. However, its impact on enhanced understanding and increased willingness to adhere to advice needs to be explored further.

The addition of web marking capabilities allows for information and advice to be presented in context, which is believed to be conducive for learning and also presents opportunity for the exploration.

Furthermore, participant responses suggested that the increased communicative fidelity achieved by adding web marking might contribute to a greater sense of trust. The trust that could possibly benefit motivation and, thereby, make the patient more closely adhere to provided instructions and advice, and thereby avoid mistakes and negative consequences. This is an issue with only weak support in the empirical data and is suggested as an interesting focus for future research efforts in this area.

The defining characteristic of web marking tools is the markers are activated dynamically and presented in sync with speech. The enhance capability to guide the recipient's attention and the accompanying raise in explanatory power suggest that dynamic web marking would be the most useful for issues of a more complex nature or for which it is very important that the details are understood or that instructions are followed faithfully in each detail.
Level of complexity in the health domain is determined by the combination of several factors, such as: the inherent complexity of the issue and/or situation, the understandability of the language used in its description, how severe the effects are if the information is misunderstood or the advice is not followed and if there is trust issue.

For example, the case of dehydration presented in Problem definition section is not complex in its content and the language in which it is presented on the 1177 website is clear and understandable manner, but the consequences of getting the advice wrong are potentially very serious, even life threatening. This makes it complex issue and one in which the increased explanatory power would be beneficial.

Thus, we believe that web marking tools would be beneficial for many types of complex advice-giving situations in raising explanatory power and offering better precision in relaying advice as well as instilling trust as advice can be complemented and thereby corroborated by written sources, while at the same time offering context.

Based on the evidence presented in this master thesis, we conclude that dynamic web marking does provide a useful and complementary service to telephone-based advice-giving. Of course, there is always room for improvement and the presented design exemplified in the tested prototype should be considered a starting point to explore the usefulness of web marking in the chosen domain of health counselling as well as in other domains where there is a need for enhanced explanation.

We believe that the most interesting and promising area for further research is exploring how web marking can contribute to better understanding of medical advice. We believe that understanding is key to improve health behavior and that adherence will naturally follow if the patient understands both the how and the why.

Thus, the following question is proposed for the further investigation:

- In what ways and to what extent can dynamic web marking improve the patient's understanding and what consequences does this have for adherence and positive health outcomes?
REFERENCES


APPENDICES

APPENDIX A – The interview questions

Description of the interview:

The interview was conducted with the aim to find new ideas, background of 1177 work, and reveal the work nature, to get the idea of their work routines and procedures of telephone medical consultation. These were needed to find potential room for improvement.

The issues that were discussed during the interviews are:

– How medical advice-giving is performed;
– What means are used during it;
– What content is used;
– The general attitude of the employees to technological innovations, media and information technology;
– Problematic issues that they experienced.

The interview format was chosen because of the requirements of a detailed discussion and broader understanding of medical advice-giving over the phone before going any further into design and development.

List of questions:

– How is medical advice-giving performed?

– What tools are used by the nurse during the medical advice-giving session?

– What content is used during the medical advice-giving session?

– Describe the attitude towards digital information technology among the 1177 organization’s staff.

– Are there problems in telephone-based health advice-giving? Describe and give comments if they exist.
Appendix B gives a brief demonstration of the web page mock with markers that we have developed after the use cases design stage of the research work.

**Figure B. 1: Web page mock**
APPENDIX C - Questionnaire form

In this appendix section, we present list of questions of questionnaire form to evaluate both types of sessions:

1) Timestamp;
2) Namn (frivilligt);
3) Ålder
4) Yrke/sysselsättning
5) Användarvänligt [Telefon]
6) Användarvänligt [Telefon+webb]
7) Beskriv kortfattat (högst 2-3 meningar) din bedömning på ovanstående punkt:
8) Förklaringskraft [Telefon]
9) Förklaringskraft [Telefon+webb]
10) Beskriv kortfattat (högst 2-3 meningar) din bedömning på ovanstående punkt:
11) Förtryendebyggande [Telefon]
12) Förtryendebyggande [Telefon+webb]
13) Beskriv kortfattat (högst 2-3 meningar) din bedömning på ovanstående punkt:
14) Effektivt [Telefon]
15) Effektivt [Telefon+webb]
16) Har du några förslag på något som kan förbättras i sättet verktyget fungerade eller hur det användes?
17) Kände du dig nöjd med din nivå av egen kontroll under telefon+webb-sessionen eller skulle du vilja styra mer själv?
18) Skulle du önskat att du själv haft möjlighet att skapa eller ändra i markeringar på sidan på liknande sätt som sjuksköterskan gjorde? Om ja, beskriv varför och på vilket sätt du skulle ha önskat att det hade fungerat.
19) Skulle du vilja ha möjlighet att gå tillbaka sidan/sidorna som användes i rådgivningssituationen i efterhand med bibehållna markeringar? Om ja, beskriv varför och hur du skulle önska att det skulle fungera.
20) Övriga kommentarer och synpunkter.
APPENDIX D – Case study materials

Description of experiment in Swedish

Experiment: hälsorådgivning online

Tid: onsdagen 30 november 14:00-16:30 (notera att din insats består av två 7-minutersinsatser någon gång mellan dessa tider) Hela experimentet körs på distans så så länge du kan nås på telefon och har tillgång till en Internet-anslutent dator så kan du delta.

Krav
Telefon: Du behöver kunna nås på telefonnumret du har angivet under angiven tid.
Skype: Du behöver kunna nås på det Skype-id som du har angivit under angiven tid.
Webbläsare: Du behöver ha en internet-anslutent dator med webbläsaren Google Chrome installerad - applikationen har några begränsningar som gör att den inte fungerar lika bra i alla webbläsare och rekommenderar därför att Google Chrome används i experimentet.

Din uppgift - vad du behöver göra
Experimentet är indelat i två separata sessioner:

a) enbart telefon
b) telefon+verktyg


Instruktioner om ordning mellan sessioner, ungefärlig tid för respektive session samt instruktioner för varje tillfälle kommer att skickas till dig i separat meddelande via e-mail.

Verktyget
Verktyget som kommer användas i sessionen telefon+verktyg har utvecklats av mastersstudenten Anton Vlassenko och består av ett system för live-markering på webbsidor. Det kommer att användas som komplement till telefonrådgivning i sessionen telefon+verktyg och telefon används alltså för röstkommunikationen i bågge sessioner.

Rådgivare från 1177

Inspelning
Försöket kommer att spelas in, men inspelningar kommer enbart att användas för internt bruk för att analysera interaktionen mellan dig och rådgivaren.
Topics for participants

Ämne nummer 1
Du kan inkludera ytterligare symptom som t ex:
1) buksmärta
2) för barnet ovanlig/ny kost
3) huvudvärk
4) barnet verkar nervöst

Ämne nummer 2
Du kan inkludera ytterligare symptom som t ex:
1) torrhosta
2) trötthet
3) dåligt humör
4) förvärrad hosta vid fysisk aktivitet

Topic # 1
Your sister/brother has asked you to babysit for his/her boy/girl who is 4 years old. After a while, the child becomes sick and starts vomiting. You do not know what he/she has eaten earlier in the day and are not able to contact the parent. You turn to 1177 for help and wait to be called back by the nurse to describe the situation.
You can include additional symptoms such as:
1) abdominal pain
2) unusual/new diet
3) headache
4) the child seems nervous

Topic # 2
Your sister/brother has asked you to babysit for his/her boy/girl who is 4 years old. After a while, the child becomes sick with a bad cough. You do not know if the child has felt poorly earlier in the day and you are not able to contact the parent. You turn to 1177 for help and wait to be called back by the nurse.
You can include additional symptoms such as:
1) dry cough
2) fatigue
3) bad mood
4) cough worsened during physical activity
**APPENDIX E – Future Improvements**

In this appendix section, we present a discussion on the issue of the distribution of control, possible future suggestions about improvements, and functionality adjustments in marked tools based on the participants’ standpoints.

**Distribution of control - Page change control issues**

In the current version of the co-browsing service, only the nurse has the ability to execute a change of web pages. Her browsing causes the patient web page to change to the web page that the nurse has. In this experiment, the ability to browse for the patient’s web page was not included. Its implementation is the same as for the nurse, so this feature can be added if required.

A key purpose of this tool is the assertion that the nurse and the patient must be on the same page and see the same content. If you give the patient the ability to browse the web, then he/she can intentionally or unintentionally leave the web page during the advice-giving session. Looking at the same time on the same part of the web page is very important for explaining information to the patient by the nurse. It is problematic to allow such activity to happen because seeing different things on the page can create confusion and the patient may lose the thread of conversation.

In certain situations, browsing ability can be enabled, for instance, if the patient is required to understand the specific information on a particular link of the 1177 website (websites other than 1177 are not allowed for discussions). The nurse can explain to the patient how to use this feature. Adding more stuff to patient activities can increase the complexity of the advice-giving session for him/her.

**Distribution of control—Marking issues**

The next issue of discussion is the distribution of control over marking tool functionality between the nurse and the patient. The patients in the experiment wanted to get more control over the health advice-giving situation and even to choose which features to give to the nurse.

We can say that such a proposal is contrary to the principles of counselling. If we bear in mind the roles that exist in this process—namely the role of the adviser who provides support, advice and the recipient who receives information, support and advice—the choice to choose certain areas on a web page and an explanation of this selection is the prerogative of the person who advises, but not the person who receives the advice.

A limitation of this feature for the nurse would not allow the nurse to fully use the information located on the web and would exclude the tool’s useful features from the explaining/advising process.
The question arises: Should we enable markers creation features for patients? There are two possible answers to this question. The first to enable all features usage for all partakers of the advice-giving session. This choice gives freedom to the patient to create any type of marker in any situation, providing the nurse with a more detailed or powerful description of his/her health issue.

The disadvantage of this design choice is that the patient does not know how to create markers or it may not be so straightforward, and it can bring in confusion or interrupt the nurse’s advice-giving process. In general, adding more stuff to patient activities can increase the complexity of the advice-giving session for him/her.

The second to enable all features usage to nurses only—namely, the creation of markers and focusing, and forced scrolling of web pages as well. This choice is characterized by the patient’s inability to bring in confusion by accidentally creating markers or forced scrolling during an advice-giving session. All these features will be under the nurse’s responsibility.

The possible variant will be to disable features usage for a patient by default, but the nurse can enable them during the session if the patients ask for enabling them separately. The nurse can explain the use of the features to the patient to avoid incomprehension of functionality usage.

More control can be given without requiring the patient to do difficult things by providing lower demands on usability—for instance, to capture attention of the nurse on a specific marker or unmarked word by clicking on that word/mark that underline it on the nurse side.

Striking a balance in functionality distribution is an important issue and should be carefully examined in the future. There can be no clear answer on this issue without the careful examination of the pros and cons of enabling/disabling certain functionality.

Chat

Chat usage was proposed by a participant as a one of the possible functionality adjustments. It should be remembered that the marking tool is used during a phone conversation; voice communication and use of the chat functionality is not appropriate under the existing voice communication. That is unnecessary distraction to the typing process since the patient can easily speak about what he/she needs.

Chat can be used, for example, if the user wants to print the name of the medicine that is hard to speak or pronounce, and then the medicine title can be typed in the chat and the patient or nurse sees it. However, with the co-browsing service, the user can browse the page of the medicine in a few seconds instead of typing, and then typing the medicine’s name is not required.
Also, chat can be used to copy/paste the link to a certain page, but again it will be easier to pass on the link rather than type it. Chat will require screen space, which will increase the things perceived and, thus, the actual level of complexity. This could overshadow the perception of the information seeker during the session.

There are two possible ways of applying chat in the current health advice-giving setting:

1) First is chat complementary to the marking tool and telephone communication—Here the most appropriate approach to disable the chat functionality and only to use it if necessary and by patient demand. Chat is used by patients mainly for typing specific names of drugs or medical terms.

2) Chat replaces voice communication, marked tools are used—This scenario of chat is used by patients who for certain reasons do not want to communicate verbally or are unable to do it, but are able to listen to the nurse advice. Though this scenario can be used for patients with certain communication disabilities, its application requires more careful and in-depth investigation. In addition, chat can be used by the nurse, for instance, in multiple simultaneous advice-giving sessions where voice communication is not used, giving the nurse the ability to concentrate only on chat communication.

Both these ways represent communication alternatives for the patients. Of course, they also require further investigation.

Markers saving

The ability to save markers and return to them later after an advice-giving session was proposed by one of the participants. The benefit of this scenario is clearly stated—namely, the opportunity to repeatedly come back to the marked content—in order to avoid forgetting or misunderstanding.

In addition, we can say that markers’ saving is also an important requirement for the application of this service in everyday practice for the 1177 department. The reason for this is that every advice-giving session needs to be recorded and stored to solve possible disputes and complaints about the quality of the advice-giving sessions from patients.

Markers comments

Another proposal sought comments for markers. This can be very useful and may contain more specific, personal information that is relevant only for that patient, such as the number of hours, dosage, certain signs or symptoms to which the nurse wants the patient to pay attention.

Markers comments are additional written records, and, therefore, might offload the demands of advice seekers on memorizing sequences of actions, where the order has an important role and to avoid patients’ forgetfulness.
An interesting scenario was proposed to mark the web page and then send the link to it before the start of the session. This scenario can be useful for online health advice-giving support when people ask questions on forums. The answers to such questions can be represented as marked 1177 web pages, making them more concrete for patient demands.

Also, such functionality will leave no place for the patient to miss something because everything will be on the web page and he/she will have opportunity to continue to learn about symptoms by browsing the 1177 website.

In addition, all the above-mentioned complementary features can be used together in one scenario for telephone-based health advice-giving. This scenario can provide enhanced opportunities to discuss health-related issues, symptoms, complaints, and instructions. It can be very valuable for further exploration of complementary tools and features for telephone-based health advice-giving. This research may help in triggering a search for better alternatives that match the preferences of patients to provide the most preferable way of health advice-giving for specific advice seekers.
APPENDIX F - Results of evaluation form

Table F. 1 User Friendly results

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Table F. 2 Easy communicate results

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Table F. 3 Sense of personal contact results

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Table F. 4 Explanation power results

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</tr>
<tr>
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</tr>
</tbody>
</table>

Table F. 5 Confidence building results

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<th>Participant number</th>
<th>Telephone: Confidence building</th>
<th>Telephone + tool: Confidence building</th>
</tr>
</thead>
<tbody>
<tr>
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<td>2</td>
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<tr>
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<td>5</td>
</tr>
<tr>
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<tr>
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<td>3</td>
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<tr>
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</tbody>
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Table F. 6 Effectiveness results

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<tbody>
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<td>3</td>
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<tr>
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</tr>
<tr>
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