

**The Role of Usability Evaluation in the  
Process of Media Management.  
In focus: Helsinki Library Website (HELMET)**

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<p>Abstract:</p> <p>The present research pertains to the field of Web Usability. Specifically, the usability of Helsinki Metropolitan Area Libraries (Helmet) website was studied from users' perspective, with a focus on user needs, user experience, navigation paths and tools. The research questions were formulated as follows: 1) how well informed is the public about online and offline services offered by the Helmet Library? 2) how do the users navigate and search for information on the website? 3) in what ways may the website be improved to enhance user experience? A mixed method was applied, relying on both qualitative and quantitative data. First, a pilot survey was conducted to explore what people know about library services, and which services they use or are interested in (50 respondents answered 23 questions). Based on the survey results, a usability testing with an eye-tracker, followed by post-test interviews, was conducted. In the eye-tracking part, the method of critical tasks performance was used: each participant was asked to complete five tasks specific for the Helmet website, for example, "Find e-book instructions". The pilot survey results showed that while some of library services were well known and important for the respondents, there were also services unknown to most respondents. Based on the data from the eye tracking testing, common navigation paths were found. We also identified the most used and the most seen navigation tools, and some common errors. The thematic analysis was used for exploring post-test interviews' material. We discovered some key themes. For example, the theme "Puzzling" included two main ideas of the participants: about the "overwhelming" nature of the Helmet website, and about the library meaning in the modern life of Helsinki. Based on all the findings, a number of recommendations were produced on how the website could possibly be improved. The navigation element "item search box" was found to be frequently used with errors, and its current realization should be revised. The E-library section and navigation inside it worked efficiently and did not require correction. It was recommended to re-build the Helmet homepage basing on the users' key interests and tasks. Currently, there exists a tangible information gap between the Helmet library network and the citizens; it is worth to explore this gap further and to find ways to overcome it.</p>	
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# 1 INTRODUCTION

Helsinki Metropolitan Area Libraries (Helmet) is a library network comprising city libraries of Helsinki, Espoo, Kauniainen, and Vantaa. It offers more than 50 different services, ranging from basic ones, such as borrowing books, printing files, using online resources, to somewhat unexpected ones, such as borrowing musical instruments, organizing events, watching online movies, etc. In total Helmet includes 63 libraries and 6 bookmobiles, with the collections comprising 3.4 million items. Annually, Helmet welcomes approximately 17 million visits, of which more than 5 million are Internet library visits served by Helmet website. [Helmet, Helsinki Metropolitan Area Libraries].

The Helmet website was launched in 2003, and a modern version was presented in 2015. The site unites all networks' public libraries in Helsinki Metropolitan Area under the brand Helmet. It allows each library to manage relevant parts of the content independently. This website is linked to the Helmet Catalogue website to provide the search of library items, e. g., books, magazines, e-books, sports equipment, etc., through all Helmet public libraries. Thus, the Helmet website serves for users as an important source of information about libraries, their inventory, events and news..

As with any public institution providing information resources and other services, Helmet needs an efficient, easy to use and intuitively comprehensive website to communicate with the users. Does the current version of the website reach this goal? What should be done to make sure that the library website suits the usability standards and fulfills the users' needs and expectations? In order to assess efficiency and usability of a website, the following questions should be addressed:

- how easy it is to use the website?
- how do people navigate and search information on the website?
- which tools do they use?
- what disturbs and what helps them complete their task?

A theoretical and methodological framework for usability studies is provided by such disciplines as Human-Computer Interaction (HCI), Psychology of Usability and Interaction Design. This topic was pioneered, among others, by Jacob Nielsen (Nielsen 2001, Nielsen & Pernice 2010, Nielsen 2012, etc.); for a review, see for example the books

(Harvey & Stanton 2013, Schmidt & Etches 2012; Pernice & Nielsen 2009; Kalbach 2007; Dix 2004). The key theoretical concepts relevant to the present study are “usability”, “user experience” and “web navigation”, see Chapters 3 and 4 for further discussion.

According to an interview with library staff, previous research of the Helmet website was based on Helmet team meetings and brainstorming sessions, collecting site visit statistics, gathering information about visitors’ opinions and library experts' suggestions (Soininen 2016). However, the website user experience and usability aspects were not studied directly.

This research addresses the problem of evaluating usability of the Helmet website from users’ perspective, exploring the user experience with the focus on navigation paths and tools. More precisely, we divided the problem into the following research questions:

1. How well informed is the public about online and offline services offered by the Helmet Library?
2. How do the users navigate and search for information on the website?
  - What are some common navigation paths used?
  - Which tools of navigation are used?
  - Which tools of navigation are seen by users?
  - How users assess their experience on the website?
3. Based on the findings from the previous questions, in what ways may the website be improved to enhance user experience?

Taking into consideration the nature of the research questions, a mixed method was chosen, relying on both qualitative and quantitative data. Mixed methods are quite common in usability studies, because this approach allows the researchers not only to identify the problem, but also to explore the reasons behind it, in order to get a deeper understanding (Norlin 2002). The practical part of the research was divided into two parts: a pilot survey and a usability test with eye-tracker, followed by post-test interviews.

The goal of the pilot survey was to investigate the general knowledge of services offered, amongst the users of various library services, which services they use, and which services are attractive for potential use. To this end, a questionnaire was created, which included 23 questions. Fifty respondents took part in the pilot survey.

In the eye-tracking part of the research, we used the method of critical tasks performance (Schmidt & Etches 2012). The method consists in exploring how a user completes certain tasks using a system which was designed specifically for those tasks. The test consisted of 5 critical tasks. 12 respondents took part in the testing, which resulted in 8 recordings of acceptable quality to perform analysis. The eye tracker “Tobii Studio. Version 3.3.1”, provided by the eye tracking laboratory of Arcada University of Applied Sciences, was used for the test. It allowed to record users’ paths of navigations, and to register their eye gazes and eye movements on the website when performing the tasks. The collected data were analyzed as follows:

- some typical usability metrics, such as e. g. success rate, number of errors, etc. were computed. See Section 7.1;
- the recordings were analyzed visually to identify some navigation paths used, typical errors appeared during completing the same tasks. See Section 7.2;
- the metrics provided by the eye tracking software, e.g. time to first fixation and mouse click count, were used to identify which navigation tools are seen and used and which are not. See Sections 7.3.1-7.3.3 for further details.

The post-test interview was conducted straight after the eye tracking test, and hence can be described as interviews with stimuli material (in this case, observing the website) (Holmqvist *at al.* 2011). It contained questions about actions, self-corrections, feelings (Likert scale), as well as open-ended questions about problematic situations when completing the tasks. This provided data about users’ own assessment and feelings about their experience, and their expectations towards the Helmet website.

In the main text, we refer to the pilot survey as Phase 1 of the research, to the eye tracking test as Phase 2 and to the post-test interview as Phase 3. The main content of the thesis is presented in Chapters 2-10. In Chapters 2 – 4, we discuss historical perspective of using the libraries’ services, describe key concepts, theoretical background and results of previous research. Chapter 5 describes the methodology and research design.

Chapters 6 -- 9 describe the results, analysis and recommendations, and conclusions are made in Chapter 10. After the list of references, an Appendix contains supplementary material, such as questionnaires, consent forms, etc., used during the research.

## **2 HISTORY OF ONLINE LIBRARY USE IN HELSINKI**

The history of the Helmet library as an online service started in 2003, when the Helmet website was launched. Initially, it contained only a catalogue, which provided library users of Espoo, Helsinki, Kauniainen and Vantaa with information about library items and materials. However, the libraries' schedule, news, events, etc. were published on separate sites of these four cities. According to Helmet developers, this did not give the users the whole picture and a united experience. Later, in 2010, the administration of Helsinki Metropolitan Area Libraries took a decision to develop web services further and to build a common website. This site represents all the libraries of the network on the Internet under the single brand Helmet, and has common content management system. This system, on the one hand, allowed each library to manage the correspondent content independently, and, on the other hand, provided the centralized functions for the Helmet head office. The common website parts included such general sections as "Info", "Rules" and "News". The Helmet website updated version was launched in 2011. It was named "Helmet web service, version 0.1" and linked with the Helmet Catalogue website for searching items in libraries' collections. Paraphrasing Ruth Connell, the Helmet website version 0.1 was supposed to become "an integral part of a library's identity" (Connell 2008), and to serve as a search portal, a place for information about the libraries, and marketing tool at the same time.

With the development of technologies and the start of the era of smartphones and mobile Internet, it was decided that the Helmet website should transform and adapt to the new demands. So, in 2015 the Helmet website was renovated. In the new user interface, the most frequently sought information and tools were prioritized, such as the item search, library opening hours, contact information (library pages). In addition, the visibility of the following services was to be improved: guidelines for using e-resources (paths for e-resources), event calendar and search. The idea behind these changes was to improve the user experience on smartphones and tablets.

However, in the autumn of 2016, the Helmet reported to the author (Soininen 2016) that no usability research of the Helmet website was conducted after the last website renovation. Thus, there were neither any data about the user needs, nor a clear picture about user experience on the Helmet website. It should be highlighted that despite the modern trend to use mobile internet for checking websites, according to Helmet data, the desktop version of the Helmet website is used by customers generally: desktop 67 % vs mobile 22 % and tablet 11 % (Soininen 2016). Thus, the question about the usability and user experience on the website was risen by the author, since these are the key factors of success for such interactive systems as websites (Garrett 2010).

Anthony S. Chow stressed out the usability and user experience aspects talking about the lack of collaboration with the users: “The usability for general users remains unknown, although the principles of Human Computer Interaction and User Centered Design suggest that it is difficult to achieve high levels of usability with any level of specificity around unique users without close collaboration with the users a site seeks to serve.” (Chow *et al.* 2014). Alan Dix summarized the importance of user experience when building and testing an interactive system very simply and concisely: “the central message – the user” (Dix, 2004, p. 195). However, in real life, the user experience is often neglected. In attempt to be modern and competitive, organizations add new interesting and “useful” features into their products or systems. As a result, websites with ever-expanding feature sets become increasingly unwieldy and hard to use, while little attention is paid to what users like, find valuable, or are able to use (Garrett 2010, p.11).

Given that the modern library institution is a significant resource of knowledge, development, communications, co-creation in the modern society, its online presence and the related usability aspects are particularly important. Therefore, the author has chosen the Helmet website to be the object of a usability study, with the aim to explore the library’s user experience and to contribute to the library website development.

### 3 CONCEPT OF USABILITY

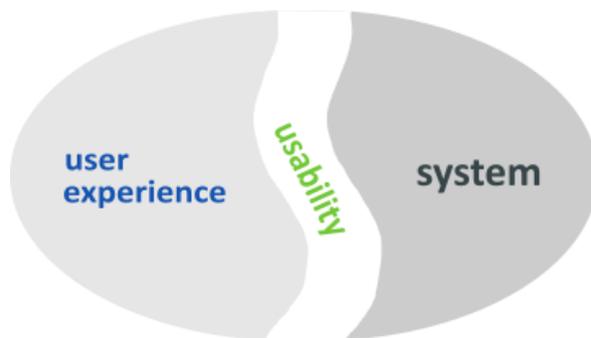
The term “usability” appeared in descriptions of various engineering development processes and in research more than fifty years ago. It came from the era of Ergonomics and Engineering Psychology and its applications to the military and industrial areas. In 1980’s the term “usability” became a key point in human-computer interaction research. The first attempts to describe this concept concerned such common ideas as “easy to use” (Miller as cited in Harvey & Stanton 2013: 18), “user friendliness” (Dehnig as cited in Harvey & Stanton 2013: 18), and “user-perceived quality” (Dzida as cited in Harvey & Stanton 2013: 18). This initial view was criticized for overweighting users’ cognitive and social characteristics, and not taking into account the processes of learning and adaptation to systems and products (Adler & Winograd 1992). Further development of these studies required a formal definition of usability as a measurable and quantifiable concept. Brian Shackel was the first to provide such a definition. He considered that usability should be defined by “interaction between user, the task, and the environment” (Shackel 1986 as cited in Harvey & Stanton 2013). Shackel suggested four factors to describe a usable system: effectiveness, learnability, flexibility, and attitude.

The concept of usability was developed further by several scientists. For example, Donald Norman concentrated more on the user’s perspective and design philosophy. Jakob Nielsen developed usability engineering, and Ben Shneiderman created “Goals and Rules of Usability” (Harvey & Stanton 2013). Finally, usability got a universal description and guidelines in ISO (International Standards Organization) due to Nigel Bevan. One of the modern and often cited versions of the term “usability” is presented in standards of International Organization for Standardization:

“Usability is extent to which a system, product or service can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use.” [International Organization for Standardization ISO 9241-210:2010, 2.13].

At the same time usability could be defined as an index which measures and shows the quality of a user experience during the interaction process with a system (Nielsen 2012). Human-Computer Interaction studies include two parts, which should be considered and understood: computers (their limitations, capacities, tools, platforms) and people (psychological, social and error aspects) (Dix 2004, p.194). This research focused on the

human aspect of the website as an interactive system to follow the central message of interaction design: “put the user first, keep the user in the center and remember the user at the end.” (Dix 2004, p.195). Hence, from the user’s perspective, the usability measures how the system matches the user’s needs and expectations, reflects them, and how correctly it functions. The duality of the term “usability” may be illustrated by a scheme below (Figure 1). It shows that usability could be explained and should be explored from two perspectives: computers, systems, services, on the one hand, and from the person, user, on the other hand.



*Figure 1. The duality of usability.*

Jakob Nielsen defines usability as a quality of users experience during interaction with a system and describes it with five major characteristics. They are efficiency, satisfaction, learnability, memorability and errors (Nielsen 2012).

- Efficiency refers to the level of performance when a user interacts with the system. ISO 9241 defines efficiency as the total resources consumed in a task and how quickly users can complete their task. It is significant for users to be productive, so the system should support them to complete the task quickly and help to recover easily from their errors. Efficiency can be measured as the time or action required to perform a task. Efficiency metrics include the number of mouse clicks required and total time spent on task.
- Satisfaction can be defined by how pleasant the system is for the user. The notion of usability includes how people feel about using the system, whether the system supports the way they would like to carry out their tasks, do they feel that the system is helpful and easy to learn. Satisfaction refers to the user feelings and opinions about the product or system. Satisfaction is a subjective response from the user about their feelings during the interaction with the system.

- Learnability is the extent to which something can be learned. Learnability is the most necessary usability attribute as most systems or products need to be learned as easily as possible. Learnability reflects how quickly inexperienced users can learn to operate with the system and perform a task procedure quickly. Usually users prefer to use a system that allows them to be productive after a brief period. Research made on user behavior shows that users do not take the time to learn a complete system fully before starting to use it (Nielsen 1999).
- Memorability shows how easy and fast the user can remember and reestablish his skills when one returns to the system after a period of not using it.
- Errors: This element illustrates how many mistakes do users make, how severe these errors are, and how easily users can recover from the them.

This research refers extensively to the studies of Jakob Nielsen, one of the pioneers and leading experts in web usability studies and testing. The above characteristics have been a ground for common usability metrics in web usability evaluation, such as Success Rate or Completion Rate, Time of Completion and Satisfaction. For more information about these metrics and their method of calculation, see Chapter 5. Method/ section 5.3. Phase 2: Usability testing of websites.

### **3.1 Users Experience, Needs and Information Seeking Behavior**

User experience in the context of libraries' website usage could touch such theoretical aspects as information need, information seeking behavior and users' expectations. Specificity of web services means that their goals as a successful product come from outside, from the audience who will use these sites (James Garrett 2007 p.28). Thus, the content of web resource should be built to reflect the users' needs, expectations and match their goals. In social and psychological sciences information needs are described as an attribute of a person, interacting with a system. For example, Robert Taylor defined the users' information need as a "vague sense of dissatisfaction" where their active cognitive state is troubled by the "certain incompleteness in his picture of the world." (Taylor as cited in Case 2007). Belkin, Oddy, and Brooks refer to this infor-

mation need as an Anomalous State of Knowledge (ASK), which begins a negotiation process between user and information system (Belkin *at al.* 1982). Users actively begin seeking information in what Dervin refers to as a “sense making” process where “knowledge is the sense made at a particular point in time-space by someone.” (Dervin 1998). According to Donald Case, information seeking is not always a result of need to solve the problem or to make a decision (these activities have a clear cut- short-term end). There are other motivators behind it such as a desire to have more information, stimulation, or assurance, or less uncertainty, boredom, overload, or anxiety (Case 2007).

Kalbach, describing information seeking, mentioned that this process is not a linear one, and people move through various stages or states (Kalbach 2007). The “Berry-picking model”, introduced by Marcia Bates, a professor at University of California, illustrated how people zigzag through online resources and change search strategies rapidly. She compared searching for information online with gathering of berries, because the solution to the original question generally is the culmination of many steps. The same way people need to move from bush to bush to spot berries, changing their approach fluidly (Bates 1989). Users constantly evaluate and re-evaluate what to find for the relevance to their information need.

In his turn, Kalbach described online information seeking as negotiation between the seeker and the system. He believes that web designers and developers, creating the navigation system, often assume that people will take a single, direct path to the information they are looking for. However, users may use various paths of navigation to get the necessary information: “enter the website from a search engine on a page deep in the site’s structure, move up to the home page, perform a keyword search, navigate to another page, and then pick one of the categories in the main navigation” (Kalbach 2007). Therefore, web navigation should be flexible enough to accommodate the behavior of such users and support the evolving search. More detailed view on the navigation paths as the elements of user experience was presented in Chapter 4 Web usability/ Section 4.2 Navigation paths and tools in focus. What information needs could be crucial for the Helmet website users and how these needs were explored in the research, the author described in the methodological and results and analysis parts, respectively.

## 3.2 Differences in User Experience

User experience in web design and web development is the process of interactions between a user and web service (website). User experience incorporates the result of how a person feels and acts during the contact with the system. According to J.J. Garrett, quite often, when the first interaction with a new system is not successful, the user gets an impression that they have done something wrong. Users could later change their mind and conclude that the site did not work the way they expected. However, they still feel bad and remember this confusing situation (Garrett 2010). J.J. Garrett mentioned this unpleasant moment and commented it the following way: “If you intend to drive people away from your site it is hard to imagine a more effective approach than making them feel stupid when they use it” (Garrett 2010, pp. 23–25).

A good user experience means that a user achieves their goals and is satisfied with the process. Web development goal is to create a website which is easy to use, allow to feel its value and experience pleasure. This is a vital moment, because mostly the user faces the site alone and no manual instruction to read in advance or training to help guide them through the system, they only use their personal experience and stay or close it immediately without coming back. Hence, in order to create and maintain a successful website, it is crucial to understand users’ needs, desires, expectations and limitations.

According to Peter Morville (2004), the success of the website depends on how users find it: “Does it have the information what I need? Is it pleasant to use? Is it easy to use? “These are some of the questions that come to a user’s mind when interacting with a website. (Morville 2004). Morville put together seven usability facets or qualities in a visual form and named it “User experience honeycomb”. This model was designed by Morville to help people understand all aspects of user experience on Web. Moreover, it serves as tool for developers’ team and clients to define priorities in the design and development process, to build the process and to focus on the chosen some.

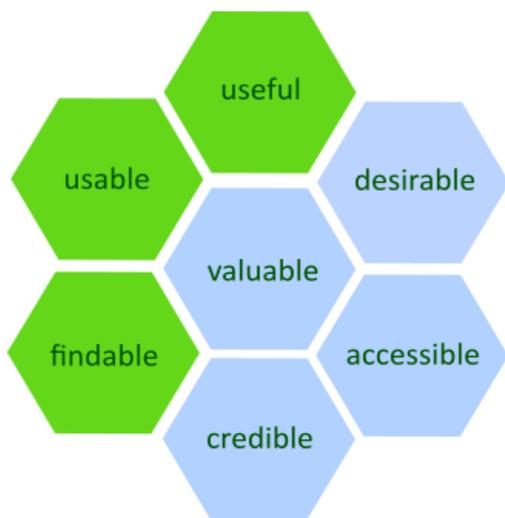


Figure 2. Peter Morville's "User experience honeycomb".

**Useful.** The designers, developers should ask themselves: Is a new product, service indeed useful and feels in need? How to be sure that the innovative solutions provide more usefulness?

**Usable.** A web service or system should be simple and easy to use. They should be designed in a familiar way, for the users to understand them easily.

**Desirable.** This facet describes how a web service or system affects the user's emotions and influences their satisfaction. It is the emotional design's responsibility to transmit the power and value of image, identity, brand.

**Findable.** A web service or system design should care about how people navigate. The desired content should be found easily and quickly. The system should provide the user with the information how to correct their actions to reach the goal.

**Accessible.** It means that a web service should be accessible for people with different abilities, including restricted abilities as well, so that the ethical concerns are met.

**Credible.** A web service or system should be trustworthy, the users should feel that they can rely on the web service provider. So, it is significant to consider the design elements that influence users' trust.

**Valuable.** Websites must deliver value to the clients and the owners of web services. For non-profit organizations, the user experience should advance their mission. In case

of for-profits, it should contribute to the general input and improve customer satisfaction.

In the present research, the author addressed three elements of the Morville model, including “useful”, “usable”, “findable”. In context of the study one more significant issue should be mentioned in relation to the user experience, site navigation and user satisfaction. According to the data by Carol Kuhlthau, users’ confidence can vary as they search information (Kuhlthau 1999). She showed that visitors may be optimistic at the beginning, but as they progress and face with more information, their confidence may dip. This is a critical point where people either proceed, back up and return to previously-visited pages, or stop a search completely (Kalbach 2007). Coming back to the usability evaluation, particularly to its satisfaction metric, this fact should be taken in consideration to explain possible findings and observations. The revealed data concerning this aspect could be find in the Chapter 8 “Analysis of Phase 3”.

## 4 WEB USABILITY

### 4.1 Web usability criteria

Based on the collected knowledge form web design and usability literature, seven factors, which determine the usability of websites, were identified, namely: screen design (layout), content, accessibility, navigation, consistency, interactivity, and media. These factors should be considered as criteria of web usability (Hassan & Li 2001).

**Screen design (Layout).** Layout is divided into three categories such as space provision, choice of color and readability.

**Space provision.** Space provision refers to the proper location of space for function and content displayed in a web page to help users focusing their attention.

**Choice of color.** Proper use of color is highlighted almost in all web design guides, because it improves learnability and ease of use beside the attraction of users.

**Readability.** One of the main objectives of web usability is to provide readable content, because reading from a computer screen is different from reading from paper. According to Nielsen (Nielsen 1997a) user reads 25% slower from a computer screen than a

paper. Due to this reason web should not have much content. Morkes and Nielsen (Morkes & Nielsen 1998) research states that users find it difficult to read if there are large volumes of information on a screen. They prefer to scan text and pick out key-words and skip the words that are not related to their interest.

**Content.** The content of a webpage depends largely on the goals of the site, but to ensure website usefulness a designer should keep in mind the basic elements of the document. According to Lynch and Horton (Lynch & Horton 1999 as cited in Hassan & Li 2001), basic elements of the document are who, what, when and where. These elements describe the owner of a website, its key message or an offer, up to date of suggesting information, and the geographical characteristics of the web resource.

**Accessibility.** Accessibility is the most important criteria to attract as many users as possible from different locations. A high level of accessibility will lead to a high level of usability. Accessibility includes loading time, browser compatibility, and search facility. Loading time is the time that it takes to download data and files from a server. It also could be defined as the time users have to wait from a browser to download data and files from a web server. Long download time is one of the top sources of frustration users face on the Internet. A slow download speed can affect the quality and usefulness of the site. Apart from that, the website designers should consider different browsers used across the world and provide a content compatible to all the main browsers (Google Chrome, Mozilla Firefox, Microsoft Explore, Opera, Safari) and to their different versions. Search facility is necessary for a website of a larger size. Providing this facility speeds up people search for information on a web resource. One of studies run by Nielsen in the Sunsoft usability laboratories in 1994 found that a search facility is highly recommended by the participants (Nielsen 1997b).

**Navigation.** Navigability is a core and basement of an effective website. With good navigation system users know where they are and where they can go next. According to Hassan, a well-thought-out web navigation is crucial to make the user experience enjoyable and efficient (Hassan & Li 2001). In addition, he noticed that web navigation could include a logical tree-like structure: limited list of contents or menu, limited number of links to the desired content and navigational tools in all pages. However, he stressed out that the applicability of navigation tools, eventually, depends on a set of factors, including user experience, user environment, technology used and culture.

**Consistency.** Websites differ from each other in terms of design, e.g., some of them put the menu bar at the top of the screen and others use a vertical position. Therefore, there are always some elements that are not familiar to the users when they visit a website for the first time. So, a well-thought design logic is important for users' learning. A consistent layout for title, background, navigation links and icons would help users to learn easily and quickly on the website.

**Interactivity.** Interactivity is one of the key factors that contribute towards highly usable websites. Interactivity is a two-way communication between users and site owners that allows users to give feedback and comments concerning the web site.

**Media use.** The use of media such as graphics, images, animation and audio on websites makes them different from information presented on paper. Studies on on-line electronic materials have shown that the integration of this kind of media keeps users' attention and can enhance web usability. However, designers and developers should remember that these elements may distract users and affect usability. The main multimedia issues are sound, graphics, images, audio and video (Hassan & Li 2001).

Usability evaluation, in a form of testing web services or products with end users, is a common practice. According to Preece (1994), a usability evaluation is concerned with collecting data about the system usability based on the definite goals of the specified group of users. An evaluation may employ different methods for measuring the usability and identifying specific problems related to usability of the website, such as informal user studies, formal experiments, task-based usability studies and heuristic evaluations. (Carol M Branum. 2011). In the present research, the stress was done on exploring the navigation criterion as core and basement of an effective website (Hassan & Li 2001), on the one hand, and user experience, including "useful", "usable", "findable" qualities (Morville 2004), to assess the usability and highlight the existing navigation paths and possible problematic areas with navigation tools. The concept of navigation paths and tools will be discussed further in the following sections and chapters. In addition, the task-based usability test (critical tasks performance test) was described in detail in the methodological part to present the method chosen for the purposes of this research.

## 4.2 Web navigation. Navigation paths and tools in focus

Navigation plays a huge role in shaping user experience on websites. It should provide an access to the information to enhance understanding, reflect a brand, and message the overall credibility of a website (Kalbach 2007). The elements of navigation and their functionality not only determine whether the users can find the information on a website, but also influence the overall impression users get working with the site. According to James Kalbach, web navigation could be defined in three ways:

- The theory and practice of how people move from page to page on the Internet.
- The process of goal-directed seeking and locating hyperlinked information (browsing the Internet).
- The bunch of the all links, labels, and other elements (for instance, banners) that provide access to pages and help people orient themselves while interacting with a website.

Navigation system is believed to be not only a set of the tools providing the user with access to the material, but also the mean which reveals the site's (content) relevance to the user's current need (Kalbach 2007, pp.21-22). The importance of user needs was described earlier in the Chapter 3/ Section 3.1 User Experience, Needs and Seeking behavior.

Usually websites have a mix of navigation types including structural navigation, content linking (associative navigation) and search and filtering mechanisms (utility navigation). Each supports a potentially different mode of seeking, and the whole navigation system provides the users with an efficient and balanced access to the information. It should be stressed that navigation does not reflect only how to get from one page to another, it is also about user orientation in a system, answering the questions: where am I? what is here? where can I go from here/ how can I go back? (Nielsen 1999).

Kalbach suggested to keep three main types or categories of navigation in mind during the designing a web system: 1) Structural navigation. It provides access to the content following the structure of a website and includes the main navigation and local navigation. 2) Associative navigation links across levels of a hierarchy, creating semantic relationships between related pieces of the content (contextual navigation, quick links and

footer navigation). 3) Utility navigation provides information about the site itself or site functions and may include global utility options, such as “help”, “search,” extra-site navigation and tools. Sometimes internal page navigation is defined as a separate group. It includes anchor links and jump links (Kalbach 2007). The way these types of navigation are arranged on a website plays a large role in how people perceive and use them.

Navigation paths could be identified as the optimal routes people will likely travel to reach a key content on a website (Kalbach 2007). Website structure and navigation are related, but they are not the same thing. James Kalbach compared the navigation system of a website to a constrained window of all available pages. In the context of developing websites, the key message for developers from Kalbach sounds as follows: start with end goal and not create a site’s navigation from the top to down (Kalbach 2007, p.236). It means that although the owners often emphasize the home page as the “main entrance” to their site, it is often not the actual target page people are seeking.

Navigation tools or, in other words, navigational mechanisms could be defined as a link or group of links that behave in equivalent way and have a similar appearance (Kalbach 2007). However, not all navigation mechanisms on a website are equal. Various mechanisms come together on a website to form a comprehensive navigation system, where each unit in the system plays a different role. Step navigation, paging, and breadcrumbs are simple examples of linear navigation mechanisms, which move forward or backward, i.e. step by step. In comparison, other mechanisms show information structure with many details at once. Examples of these are tree navigation, site map, directory, or a-z indexes. These navigation tools provide an overview to many pages at once. However, typically web navigation consists of menus, tabs, and bars (Krug 2000). There are also more advanced navigation mechanisms, for instance, star trees, visual thesauri, and clustering displays, which visualize navigation spatially (Kalbach 2007).

To demonstrate the navigation system of the Helmet website and focus on its navigation tools as a subject of the following research, the author listed the navigation elements and described them below.

*Navigation bars and tabs* are the simplest form of a navigation bar, and, generally, exist on a webpage in a form of horizontal chain of plain hypertext links. Navigation bars quite often have a colored background to create a sense of a bar across the page. There

is a distinction between tabs and navigation bars in their presentation, however, there is no real difference in function (Kalbach 2007).

*Vertical menu or left-hand menu* (or right-hand menu if on the right) is a vertical arrangement, which has become prevalent in web navigation design. Usually vertical menus are more flexible than navigation bars or tabs, because the mechanism can easily extend downward. Additionally, vertical menus allow longer labels.

The *breadcrumb trail* shows a user's path through a website. It includes nodes, which are chained together. The nodes are linked to previously visited pages (or parent topics) and are separated with a symbol: sign (>), colon (:), or pipe (|). Two main functions of breadcrumb trail are: 1) show the current position on a website, 2) provide shortcuts to previously viewed pages and/or other areas of site.

*Footer navigation* located at the bottom of the webpage, and usually is represented by text links. Moreover, it is often used as a catch-all for many types of content (Kalbach 2007). It would be a big mistake to consider the footer navigation as an insignificant element, because it could be an appropriate place for putting the site map to show the website structure and allow the user to orientate and re-orientate on it in case of searching information.

In terms the library's website navigation, *search boxes* should be considered as one of the most relevant items of the user interface as well, because of the nature of the library users' needs and the size, structure and mission of the Helmet website.

The five navigation tools listed above were explored and analyzed by the author to reveal the existing paths of navigation mechanisms usage and understand the reasons behind them; see Section 7.3 "Most common trends in usability study: in focus navigation tools".

## **5 METHOD: USABILITY EVALUATION**

The objective of the study was to explore the users' knowledge about Helmet services, to research what was user experience (in terms of navigation) on the website and how it could be improved. The usability evaluations can capture two types of data, qualitative and quantitative data. The use of mixed methods is quite typical for usability studies as

this approach provides the data to the researchers not only to identify the problem, but to get the opportunity to explore the reasons behind it and a get a deeper understanding.

## **5.1 Approaches to research**

The above-mentioned research questions made the author think that a combination of quantitative and qualitative approaches would allow one to provide a more complete picture of a subject (Denscombe 2010) and answer these questions in a proper way due to the nature of these research methods.

This research utilized a three-phase approach in order to evaluate the usability of the Helmet website:

1. A survey to assess general public knowledge of the content available on-line and offline
2. Eye-tracking research to evaluate usability
3. Post-test interviews for reflection purposes

The quantitative research method is about collecting and converting data into a numerical form so that statistical calculations can be made to draw conclusion. Options in the quantitative research are predetermined, and usually a considerable number of respondents are involved (Habib et al 2014). The quantitative data collection methods for usability testing are surveys, structured interviews, on-line surveys, and their various modifications. The researchers use statistics to define the number of answers, errors that occur on tasks, the number of users who successfully perform tasks, etc.

Qualitative methods are more concerned with the personal experience related to the problem under study. They are about collecting and analyzing data by observing or interviewing what people do or say (Habib et al 2014). There are many methods and techniques for usability evaluation depending on the goal and resources available for the test. In the present research, the author has chosen a set of techniques based on the theoretical part of the study, and taking into account research process limitations, such as time and financial resources.

According to Preece (1994), usability evaluation is focused on collecting data about usability of a product, a system or a service with a specified group of users performing certain activity. In general, usability evaluation has three main goals: to assess the ex-

tent and accessibility of the system's functionality, to assess users' experience of the interaction, to define any specific problems with the system (Dix, 2004). The evaluation could include different methodologies (qualitative, quantitative, mixed variants) for measuring the usability and identifying specific problems related to usability of the web site.

The convenience sampling was used for the entire research due to the restrictions of access to the audience and stationary location of the eye-tracker. The convenience sampling is defined as a choosing of sample built upon selection that suits the convenience of the researcher and is limited by the research conditions (Denscombe 2010). As such, there are limitations to how much the results may be generalized to a broader population.

In order to assure quality of the findings, the author must demonstrate the credibility of the research. It is based on the concepts of reliability and validity. Reliability shows that a "research instrument is neutral in its effect and consistent across multiple occasions of its usage" (Denscombe 2010). Validity refers to the accuracy and precision of the data. There are two types of validity: internal and external. Internal validity is "the extent to which researchers measure what they intend to measure." External validity is "the generalizability or representativeness of the study finding" (Norlin 2002).

To follow these requirements, the survey form was built on the close-ended "know/ do not know" questions. In the usability testing part, the difference of the laboratory conditions from the usual environment was minimal. The eye tracker "Tobii Studio. Version 3.3.1" looked like as a usual desktop computer in a class. We provided the same instructions, equal conditions and same procedure to all participants during the study. Usability researchers notice that testing respondents who do not belong to the groups of typical users may increase the risk of collecting unreliable data (Norlin 2002, p.6). In the Helmet case, the range of typical respondents is quite wide, because of the nature of the public service. The usability metrics were measured according to the theoretical grounds and experts' recommendations. To explore users' satisfaction, the Likert scale was used. As for the generalization, the test tasks were typical for the library website and built on the pilot survey results. However, it should be remembered that website testing results do not necessarily generalize to the entire user population (Norlin 2002, p.6).

## 5.2 Surveys

There is a wide spectrum of usability technics in the field of Human-Computer interaction and practice of user centered design. They include such methods as: usability test or performing critical tasks, card sorting, personas, heuristics evaluation, interviews, questionnaires, cognitive walkthrough, surveys.

The author focused on the surveys as one of the methods for the research. So, the theoretical knowledge about the surveys should be taken in account. This method is often considered as an easy, quick, inexpensive and accurate way to get the required information. Surveys are often made to assist the decision-making process. Surveys of customers are made to create or modify product or service for a certain public. Surveys are also made to understand or predict human behavior or conditions. It could be said that surveys of audience are done for practical reasons, to assist decision-making. This method is very flexible and versatile. It can measure physical or demographic characteristics, or attitudes, preferences and lifestyle patterns. Surveys can cover one small aspect or include hundreds of questions about various aspects. They can be made by personal interview, telephone interview, email or mail and can be done at work, home or almost anywhere (Alreck & Settle 1995).

Surveys as a tool have a number of limitations: it is difficult to measure causation; sensitive questions are often not answered; surveys require high expertise from them who carry the process. Eight basic topic categories at surveys are attitudes, images, decisions, needs, behavior, lifestyle, affiliations and demographics. Major steps in the survey process include: specifying information needs, sampling needs, instrumentation, data collection, data processing, report generation.

### 5.2.1 Sampling, ethics and analysis of the survey

Sampling: as Helmet library net is a public service of metropolitan area of Helsinki, the group of subjects could include citizens of Helsinki, Vantaa and Espoo, regardless of their mother tongue. Respondents were provided with an offline or online version of the survey (made with a free Internet tool “Google forms”), according the respondent’s preferences. The size of the sample was determined as 50 respondents, because this survey was considered to be a basic test for the tasks’ identification in the eye-tracking re-

search. According to the ethics considerations, this survey was done anonymously by volunteers.

Collected data was processed in Excel to discover a group of Helmet's most known services and a group of the most interesting services. As explained above, these findings from end users of libraries served as a ground for creating critical tasks for the usability testing of the Helmet website. The description and application of possible findings are considered and discussed in the next section. The results of the survey are presented in Chapter 6 (Results and Analysis).

### **5.2.2 The first phase: survey about existing knowledge**

The survey allowed us to investigate users' awareness of the diversity of library services, the usage of these services, and their attractiveness for the potential users. These results provided a solid ground for creating critical tasks.

The questionnaire "Opinions Survey" was created in two versions (Finnish and English) and tested several times before it was made public. First, the list of all Helmet services was discussed with the library team to choose the most important and formulate the main questions to the respondents. This list included 22 closed questions with two sub-questions for every question and one open-ended question for giving any kind of feedback to the library. In addition, the questionnaire contained a part with demographic questions. (See Appendix A).

*Three key ideas behind the questions about Helmet services were presented in the questionnaire:*

- Does the respondent know about a service? (Answers: Yes/ No)
- If answer was "Yes", the respondent was asked to rate how important the service is for them.
- If answer was "No", the respondent was asked are they likely to use it in the future?

The questionnaire was designed not only to find out what a respondent knows or does not know about the library's services, but also to explore how important the service is if

it is used by a person. In a case when a respondent did not know about the service, they were asked to rate how likely they are to use it in the future.

### **5.3 Phase 2: Usability testing of websites**

The responses to the survey were processed and analyzed to build a usability research. The research design was based on the strategies of websites evaluation suggested by Josef McGrath (Norlin 2002). McGrath describes four research strategies to evaluate a website: field strategies, experimental strategies, respondent strategies, theoretical strategies. In a “field strategy” the website is observed and tested in the field of study. Website evaluation in the light of “experimental strategy” requires controlling certain settings and conditions of environment. In the “respondent strategy” users’ opinions are explored via various surveys (offline and online), interviews, focus groups. Website evaluations which conducted based on “theoretical strategies” involve computer simulation (for example walkthrough, i.e., storyboard) (Norlin 2002).

The usability testing performed in the present research belongs to the “experimental strategy” category, because users are observed in a controlled environment (such as laboratory). Usability testing allows a researcher to collect qualitative and quantitative data how the end user performs a set of real tasks. Usability testing as a method is considered as an optimal way to understand how end users interact with the website. User tasks’ analysis provides useful information for a researcher in terms of what users can do with the system and where they face a problem. In lab tests, users were asked to perform a task with a system to evaluate the performance and effectiveness of the site.

The typical usability metrics in usability testing of websites are:

- **Success Rate (Completion rates or Successful Task Completion).** Completion rates are the fundamental usability metric: A binary measure of pass or fail (coded as 1 or 0) provides a simple metric of success. If users cannot complete a task, not much else matters with respect to usability or utility.
- **Number of non-critical errors/ confusions (Partial success).** Non-critical errors are errors that are recovered by the participant and do not result in the participant’s ability to successfully complete the task. These er-

rors result in the task being completed less efficiently. For example, exploratory behaviors such as opening the wrong navigation menu item or using a control incorrectly are non-critical errors.

- Number of errors (critical errors). Critical errors are deviations at completion from the targets of the scenario. Essentially the participant is not able to finish the task. Participant may or may not be aware that the task is not completed or completed incorrectly.
- Time on task. The amount of time it takes the participant to complete the task.
- Subjective Measures. The evaluations are self-reported participant ratings for satisfaction, ease of use, ease of finding information, etc. where participants rate the measure on a 5 to 7-point Likert scale.

The critical tasks should be prepared for the usability test to discover the usability metrics of the Helmet website. The critical tasks could be built on the base of 1) experts' knowledge, or 2) brainstorm results, or 3) research users or potential users knowledge and opinions (Schmidt & Etches 2012). The author chose the third option as the most appropriate to Helmet interests and own professional goals to get deeper into this topic. The description on this part could be found in the Section 5.4.4.

## **5.4 Eye tracking in usability research**

As said before, qualitative method in usability evaluations of websites is the most used approach to explore the common usability and navigation patterns (Nielsen & Pernice 2010). Turning back to the considered research problem and in relation with usage of eye tracker in qualitative research, the author would like to remind the second raised research question: how do the users navigate and search for information in the website? which navigation tools help them to search information on the Helmet webpage? To get the answer to this question a set of methods with using of eye tracking technology should be mentioned below.

There are three main variants of conducting qualitative usability research, using eye tracking technology's advantages for defining usability problems or their absence

(Holmqvist *at al.* 2011). They are: 1) thinking aloud method 2) retrospective thinking with gaze replays, 3) task performance with eye tracker and freely recalling the content of a stimulus (post-test interview with stimuli material or without it).

All these methods have a set of features and limitations which should be taken in consideration by a researcher. Thinking aloud method's advantages include: 1) there is no dual recording sessions necessary; 2) there is no risk of memory loss on verbal data for the individual. Its drawbacks are following: 1) decreased eye-tracking data quality; 2) task performance slower. 3) possible effect on task performance.

Retrospective thinking with gaze replays has its positive and negative moments as a method as well. Positive aspects: 1) there is no decreasing of eye-tracking data quality; 2) task performance is not slower; 3) there is no possible effects on task performance. Negative aspects: 1) dual recording sessions necessary; 2) risk of memory loss on verbal data for the individual.

Method of task performance with eye tracker and freely recalling the content of a stimulus (post-test interview with stimuli material or without it) contents the following advantages and disadvantages: Advantages are: 1) there is an extension of recording sessions necessary, but could be less than in previous method; 2) there is no decreasing eye-tracking data quality; 3) there is no possible effects on task performance. Disadvantage include: there is a risk of memory loss on verbal data for the individual.

Eye tracking is a technology of measuring where the eye is focused and the motion of the eye as an individual views a subject, for example, on a webpage (Manhartsberger, & Zellhofer 2005). The user's pupils and their position on a screen are tracked with the help of an eye tracker. This method provides detailed data about the user's visual attention on user interface elements. It can be used as a valuable source of information about users' behavior (Manhartsberger & Zellhofer 2005). Eye movements are considered to reflect the amount of cognitive processing a display requires and, therefore, how easy or difficult it is to process (Goldberg & Kotval 1999).

The original eye trackers required highly invasive procedures, but nowadays remote eye tracking measurements are made unobtrusively with the help of a remote video camera mounted below the computer monitor. Modern technologies provide a more natural user environment for the usability tests. Eye tracking has been used for different purposes for

many years, and ongoing development of modern technologies (soft- and hardware) have made it more accessible and popular as an approach to measuring usability.

According to Jakob Nielsen (Pernice & Nielsen 2009), eye tracking allows researchers to answer following questions about users:

- Where users are looking
- How long they are looking
- How their focus moves from item to item on a web page
- What parts of the interface they miss
- How they are navigating the length of the page
- How size and placement of items on the existing site or on proposed designs affects attention

So, exploring both issues where users look and their navigation paths may reveal the researcher which areas of a screen support or do not support users in the interaction process with the website when performing the specific tasks.

#### **5.4.1 Eye tracking: principles of work**

As a participant looks at a webpage, the eye tracking device focuses on the pupil of the participant's eye and determines the direction and concentration of their gaze. The software generates data about these actions in the form of gaze replays, heat maps, gaze plots or scan pathways. Eye movement measurements are based on fixations and saccades. The term "fixation" describes the eye's statement when it retains a stable position for a period of time with duration 200-300 ms. Saccade means rapid eye movement from one fixation to another (with duration 30-80 ms) (Holmqvist *at al.* 2011).

#### **5.4.2 Gaze replays, gaze plots (scan paths), and areas of interests (AOI)**

Eye tracker has a dynamic replay function, which calls gaze replay. It overlays the eye movements in the form of a colored dot across the screen over duration of the task. This is doing retrospectively, not during the actual task. The gaze replay shows where the user looked at any point in time when performing the task. According to Jakob Nielsen,

gaze replays are the most accurate method for analyzing the information in usability testing with eye tracker. He believes that gaze replays are the most valuable, because it is possible to slow down the replay and really see everything the user looked at in the order in which they were doing it. Watching gaze replays is considered the main qualitative eye tracking method (Nielsen & Pernice 2009).

Gaze plots or scan paths are static images. They visualize a participant's gaze pattern through a series of dots indicating fixations and fine lines indicating saccades. The size of the dots represents the duration of a fixation. Short fixations are indicated by small dots, and larger dots indicate a longer fixation. An area of interest (AOI) is an instrument provided by eye tracking software which allows one to select sub-regions of the displayed stimuli and to extract metrics specifically for these regions. Some of these are:

- Time to First Fixation is the time from the start of the stimulus display until the test participant fixates on the AOI or AOI Group for the first time (seconds).
- Mouse Click Count is number of clicks within an AOI during the test session.

#### **5.4.3 Sampling, ethics and analysis of eye-tracking test**

In this phase, 7-12 respondents are considered as a suitable number of respondents in qualitative eye tracking research to explore the usability of a web system, navigation's aspects and users' subjective measures (Pernice & Nielsen 2009). Helmet website as public service do not have special limitation for picking the respondents. Anyone could be a respondent and representative end user in this case, and the only main criteria is that person should have at least basic Finnish language level as the research should be started from the Finnish version of the Helmet website. Instructions were provided in two languages (Finnish and English) on paper and on the screen.

According to the ethics considerations, the usability test was done anonymously by volunteers. (See the usability test consent form in Appendix B). The sampling could be restricted by such condition that all volunteers mostly were students.

Respondents were coded for purposes of analysis in the following way.

Respondent # 1 = U1

Respondent # 2 = U2

Respondent # 3 = U3

Respondent # 4 = U4

Respondent # 5 = U5

Respondent # 6 = U6

Respondent # 7 = U7

Respondent # 8 = U8

Respondent # 9 = U9

Respondent # 10 = U10

Respondent # 11 = U11

Respondent # 12 = U12

#### **5.4.4 Critical tasks' test with eye-tracker**

The method of critical tasks performance with eye tracker and post-test interview with stimuli material (observing the website) was chosen to address the second research question of this study.

The research question was formulated the following way: how do the users navigate and search for information on the website?

- What are some common navigation paths used?
- Which tools of navigation are used?
- Which tools of navigation are seen by users?
- How users assess their experience on the website?

This method allowed to record the paths of navigations and provided the data of areas of interests (AOI), gaze spots and gaze paths. The recordings provided the material for visual analyzing what navigation paths were used by the respondents, which navigation tools were used successfully, which not, what errors were typical with current navigation system on the website, which tasks were performed successfully.

Moreover, to get this information some of the typical usability metrics in usability testing of websites, which were described earlier, were used: Completion rates (Successful Task Completion); Number of non-critical/ confusions (Partial success); Number of errors (critical errors); Subjective Measures (self-reported participant ratings for satisfaction).

The set of critical tasks for the usability testing of the Helmet website were developed, according to the insights obtained from the pilot survey results (see the section Pilot Survey for the theoretical background). The set of the tasks were organized for a respondent from the easiest one at the beginning to the easiest one at the end and with more difficult in the middle to give a respondent an opportunity to relax and feel comfortable with the test situation (Sinkkonen *at al.* 2006).

Data received about four services, rated as the most known and the most important or unknown and most interesting services were taken as a base for the following tasks.

These services were:

- Multi-language library, i.e. a collection of books in foreign languages;
- Educational and entertainment events in libraries;
- Reading e-books;
- Watching on-line movies.

As it was said before, the critical tasks were formulated based on these four libraries services. However, one basic librarian task (“To find a book”) was added as a warm-up for the respondents.

### **Creating the test tasks**

Use cases and user scenarios were transformed into critical tasks for the usability test with eye tracker. For these purpose, firstly the use cases and their possible use scenarios were described.

#### ***Use cases and use scenarios:***

- 1. Find a book.** Open the Helmet website, put into the search box the name of a book, writer’s. Press the "eye-glass" to start searching.
  - 1) Get a list of items. Click on the necessary book and get the details about it.
  - 2) Get a zero result with the search box to continue searching.
  
- 2. Find an event (to check events' schedule and choose an event).**

Open Helmet website. There are 4 optimal ways of completing this task

- 1) Find an orange horizontal menu, click on the button "Tapahtumat" (Events). System shows the page with the coming 4 events as a set of pictures and the link "Näytä lisää" (show more). Use the filter "Kaikki kirjastot" under the button "Tapahtumat" (Events) to choose the library that you need.
- 2) Find the grey horizontal menu and tap "Tapahtumat ja vinkit" (Events and hints). System shows the coming 4 events as a list. The first one is the biggest, in the end of the list there is a link "Näytä kaikki" (show all).
- 3) Find the block of coming events on the main page. Click the link "Tapahtumat" on the picture of an event or to the link "Näytä kaikki" (show all).
- 4) The last alternative way to find the event is to use the Web Search Box at the bottom.

**3. Find e-books' instructions (instructions about on-line books).** Find the grey horizontal menu (valiko menu), click the button "E-Kirjasto" (open mode of the grey menu). The system shows the common page with Vertical Left Menu with e-library services: books, films, courses, magazines, databases, instructions. Press on "Instruction" button in Vertical Left Menu. Or to press on the "Kirjat" button in Vertical Left Menu and on the opened page choose a banner "Ohjeet" (Instructions).

The alternative way is to use Web Search Box.

**4. Find a library with collection of books in foreign languages (Find a multilingual library)**

This information is essential for people who want to read books in different languages and for all people whose mother tongue is other than Finnish.

Open the Helmet website, tap on the drop-down list of Helmet libraries, scroll it, find the line "Multilingual library". Click on it and get the page with the name of the library, its schedule and the link "go to the library page". Tap the link and go to the "Multilingual library page" with information about in how many different languages Helmet has books and how to get them. See what kind of multilingual events there are in the library.

The alternative way is to use Web Search Box.

- 5. Find a collection of on-line movies.** Find “E-library” button in Grey Horizontal Menu and click on it. Click on the Films (Elokuvat) / Clicks on + sign of “E-library” in Grey Horizontal Menu. Click on the banner “InstantFix-elokuvapalvelu” on the page Elokuvat in the E-kirjasto.

The alternative way is to use Web Search Box.

(See the instructions and a set of the critical task for the usability test in Appendix C).

#### **5.4.5 Post-test interviews**

The post-test interviews were considered as a method to collect the respondents’ opinions on their experience when performing the tasks on the Helmet website to get the material for the possible insights and deeper understanding the reasons behind the respondent performance. The post-test interview included a set of the demographic questions, 6 statements about actions, self-corrections, feelings and 4 open-ended questions to get a general feedback and respondents’ opinions about problematic situations when completing the tasks in a free form (Appendix D).

The interviews were recorded on a dictaphone to have an opportunity to transcribe and analyze the answers after the test. The analysis of material was done using the Thematic analysis, one of the qualitative approaches for this kind of tasks. Thematic analysis as a method which searches for the central themes immersed in the texts of interviews (Coolican 2014). It allowed the researcher to explore the possible themes standing behind the text and discover them through the respondents’ quotations.

## **6 RESULTS AND ANALYSIS OF PHASE 1: SURVEY**

The first phase of the research included the survey on public awareness and preferences concerning the library services. The results and analysis description are presented below.

### **Description of the survey implementation:**

- 50 respondents took part in the pilot survey: 35 women, 13 men and 2 persons who preferred not to tell their gender.
- The survey consisted of 23 questions. Questions 1 -- 10 formed the main part; Questions 11 -- 23 were optional.
- The question #23 was a request about feedback in a free form.
- The inquiry was made in two languages: Finnish and English
- There were 2 versions: an on-line form (Google forms tool), where 36 answers were collected, and a paper version: 14 answers were received.
- Two communication channels were used to distribute the questionnaire: off-line communication (libraries' meetings "Finnish language café"; cafés in Itäkeskus and Forum shopping centers), and online communication (mailing, Facebook).
- The data was processed in Excel.

Turning back to the first part of the research question, i. e. how well the public is informed about the range of services (online and offline) offered by the Helmet Library, three diagrams were built to show the findings:

- Diagram#1 "Respondents' knowledge about Helmet libraries' services"
- Diagram#2 "Importance of Helmet's services from the respondents' perspective"
- Diagram#3 "Attractiveness of Helmet services from the respondents' perspective"

### **Results:**

50 respondents answered 10 questions (the main part), 47 of these 50 answered 22 questions (the main and optimal parts), and 13 of these 50 gave feedback (question #23).

The diagrams were built based on the data of 47 people to illustrate the whole picture.

The results were processed and presented in three diagrams:

### Diagram#1 “Respondents' knowledge about Helmet libraries' services”

It illustrates how many people from the sample of 47 gave the positive or negative answer on every question.

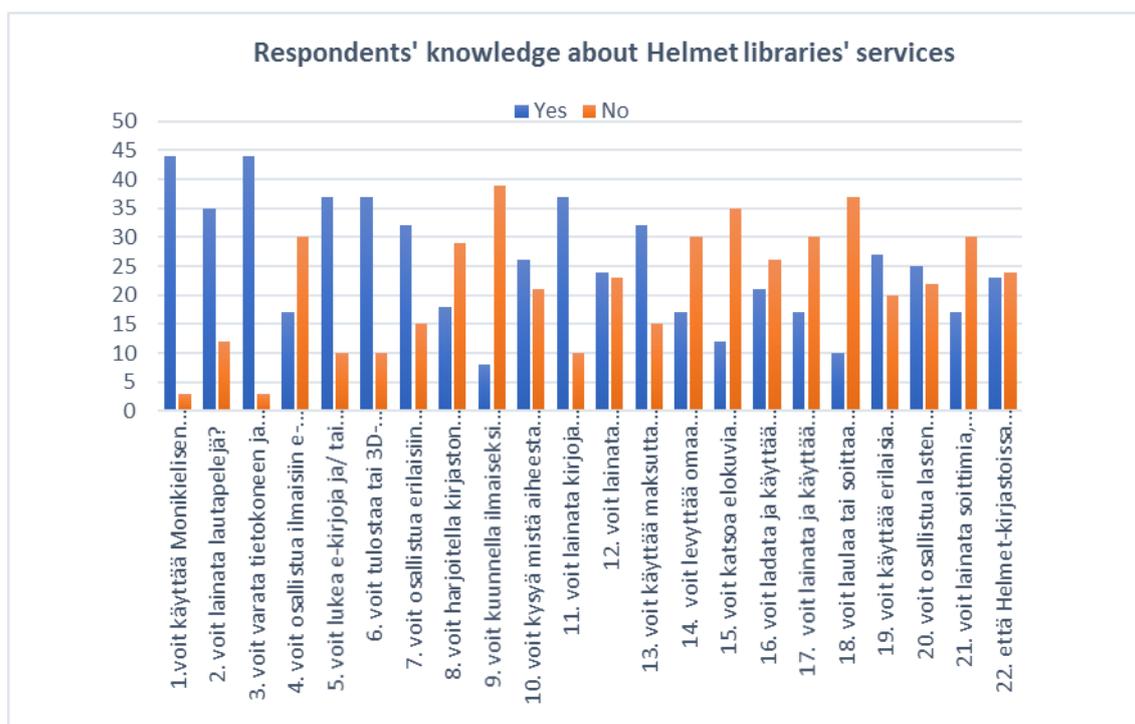


Figure 3. The first diagram shows the more known and less known services in Helmet libraries.

#### The most known services were:

1. “Using of multi-language library, i.e. borrowing books written in different languages” (#1) received positive answer from 44 respondents. The question about “Booking and using a computer to work in the library” (#3) collected 44 positive answers as well.
2. Fewer number of the respondents knew about the services “Reading e-magazines and/ or e-books anywhere using Helmet account (Finnish, English, and other languages)” (#5), “Printing (or 3D printing), coping, scanning and fax files in Helmet libraries” (#6) and “Borrowing books form other libraries in Finland, using Helmet account” (#11). 37 respondents of 47 answered “Yes”.
3. The service “Borrowing board games” (#2) took the third place, 35 respondents knew about it.

### The least known services were:

1. The first place belonged to the service “Using Helmet account, you can listen free on-line music collections from Naxos Music Library” (#9) with 39 negative answers.
2. “Perform at musical events in Helmet libraries” (#18) took the second place with 37 negative answers.
3. “Free watching movies on InstantFlix anywhere, using Helmet account” (#15) was on the third place with 35 negative answers.

### *Diagram#2 “Importance of Helmet's services from the respondents' perspective”*

For each service, this diagram shows how the respondents who knew about the service rated its importance. The collected data allowed the researcher to look at the importance of Helmet libraries’ services from the perspective of actual users (i.e. “actual customers”).

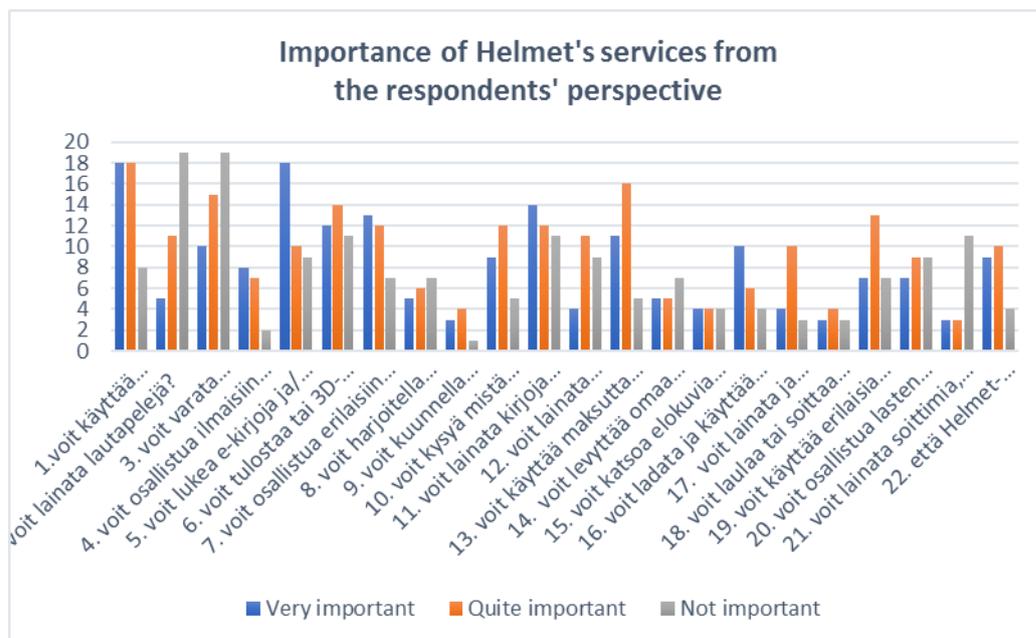


Figure 4. The diagram shows what Helmet library's services are more and less important for the respondents.

### The most important services in the respondents' point of view were:

1. The services “Using of multi-language library, i.e. borrowing books written in different languages” (#1) and “Reading e-magazines and/ or e-books anywhere using Helmet account (Finnish, English, and other languages)” (#5) shared the first place with the grade “Very important” from 18 respondents.

2. The service “Borrowing books form other libraries in Finland, using Helmet account” (#11) took the second place with the grade “**Very important**” from 14 respondents.
3. The service “Taking part in various educational and entertainment events: language cafés, art and sport work-shops, handcraft classes, painting classes, dance classes” (#7) was on the third place, having got the grade “**Very important**” from 13 respondents.

**Diagram#3 “Attractiveness of Helmet services from the respondents' perspective”**

For each service, this diagram shows how people who did not know about the service rated its attractiveness. They were asked to rate whether they are likely to use the service in the future. Hence, the collected information revealed the attractiveness of Helmet services in view of the potential users (i.e. “potential customers”).

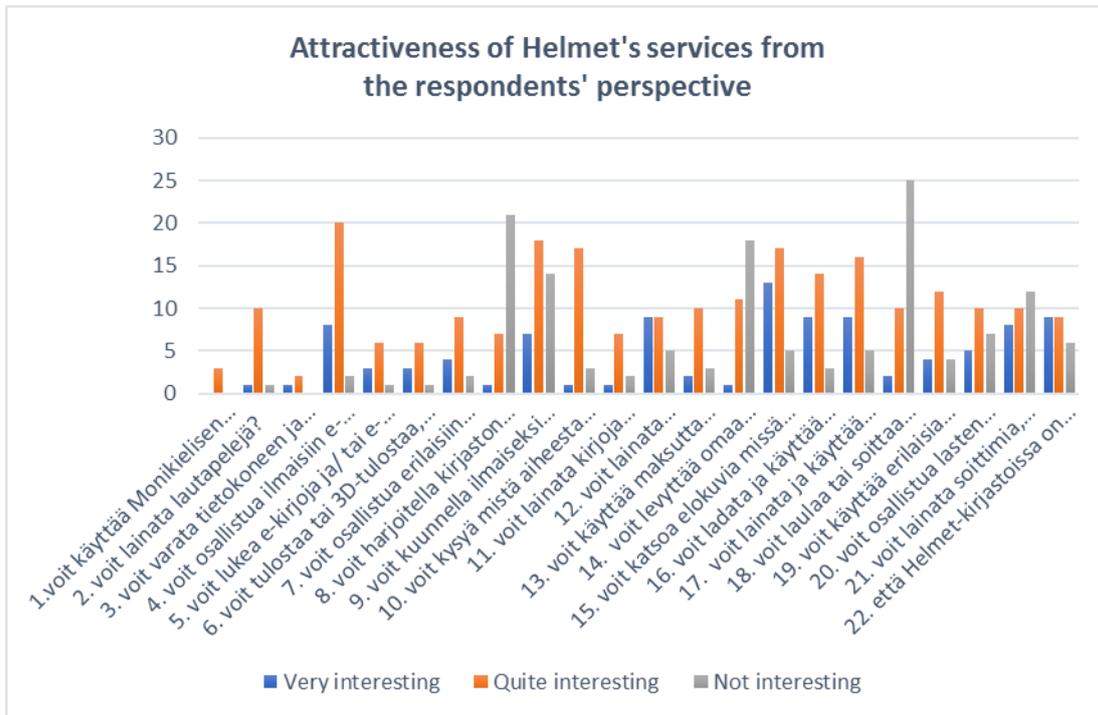


Figure 5. The diagram shows what Helmet library's services are more interesting and attractive for in the respondents.

According to the data, the most interesting services were:

1. The service “Free watching movies on InstantFlix anywhere, using Helmet account” (#15) took the first place with the grade “Very interesting” from 13 respondents.
2. The services “Borrowing sport equipment: skates, skies, tennis racquet” (#12), “Downloading and use free Helmet application “Pocket Library” to borrow books, and renew your loans” (#16), “Using or borrowing such things as: sewing machine, drill, hammer and other tools” (#17), and the service “Various art work-shops and master-classes for children in Helmet libraries” (#22) shared the second place with the grade “Very interesting” from 9 respondents.
3. The third place belonged to the service “Using of free e-courses (on-line courses): study music, Finnish and other languages” (#4) with the grade “Very interesting” from 8 respondents.

From the survey, it was possible to identify the key needs of the library customers. These included four services, rated as the most known, the most important and most interesting (attractive) options: 1) Multi-language library, 2) Educational and entertainment events in libraries, 3) Reading e-books, 4) Watching on-line movies. In addition, three of these services were called important by users who had already tried them: multi-language library, educational and entertainment events in libraries, reading e-books. The service “Watching on-line movies” was named as potentially the most interesting one. The services found to be most important or potentially attractive became a ground to build the critical tasks for the usability test.

## 7 RESULTS AND ANALYSIS OF PHASE 2: USABILITY EXPERIENCE

To address the second part of the research question, the method of critical tasks performance with an eye tracker and a post-test interview with stimuli material (observing the website) was chosen. The second research question was: which navigation tools are used and how they help to search information on the webpage? It was divided into several following sub-questions:

- Which navigation paths are used on the webpage?
- Which tools of navigation are used?
- Which tools of navigation are seen?
- How users assess their experience on the website?

This method allowed to record the paths of navigations and provided the data of AOI (areas of interest) and gaze spots. The data helped to analyze what paths of navigations were used by the respondents, which navigation tools were used successfully, which not, what errors were typical with current navigation system on the website. After completing the task, the respondents filled a questionnaire form with 6 questions and took part in an interview comprising 4 questions regarding the tasks that caused difficulties for the respondent.

Interview analysis revealed the users' assessment of the navigation system, its simplicity and usefulness, feelings about their navigation experience and common expectations towards the Helmet website. In total, 12 respondents took part in the testing, 8 of them were Finnish-Swedish native speakers and 4 people had other mother tongues. 5 tasks were performed by all of them. Instructions were provided on paper in Finnish and English. Every respondent read the instructions before performing the tasks, then people also had an opportunity to read them on the screen just before the test start (in both languages as well). In addition, before every task, the researcher read aloud parts of the instruction related to that task.

The eye tracking laboratory of Arcada University of Applied Sciences and eye tracker with software “Tobii Studio. Version 3.3.1” (i.e. a comprehensive platform for the recording and analysis of eye gaze data, facilitating the interpretation of human behavior and consumer responses) were used as the apparatus.



*Figure 6. A test-respondent of the eye tracking test. Eye-tracking laboratory, Arcada. Photograph Elena Smirnova Arcada 2017*

A stationary chair (without wheels) was used during the tests to provide the fixed distance between computer and a respondent, around 50 cm (Pernice & Nielsen 2009). A calibration procedure compulsory in eye tracking tests (Holmqvist 2011) was performed at the start of each session (Holmqvist 2011). Eye tracking recordings of 8 respondents of 12 corresponded to the necessary level of acceptability in terms of understandability and task completion to analyze them. Thus, the results of these 8 respondents were taken in consideration and analyzed.

## **7.1 Description of the critical task performance and results**

Using the criteria discussed in the Method section above, the performance of each respondent at each task was graded as a success, a partial success, or a failure. The data is summarized in the following two tables.

<b>Respondent</b>	<b>N1 Find a book</b>	<b>N2 Find an event</b>	<b>N3 Find e-books' instructions</b>	<b>N4 Find a multilingual library</b>	<b>N5 Find on-line movies</b>
U5	S	P	P	F	P
U6	S	P	S	F	S
U7	S	P	P	P	S
U8	S	F	F	P	P
U9	F	F	S	F	P
U10	S	P	S	F	P
U11	S	P	P	F	S
U12	S	S	S	S	P
Note: S - success, F - failure, P - partial success					

1 Table. The Success, Failure and Partial Success in all tasks performed by 8 respondents

<b>Task</b>	<b>N of successful tasks</b>	<b>N of Failure</b>	<b>N of Partial Success</b>
N1 Find a book	7/8	1/8	0
N2 Find an event	1/8	2/8	5/8
N3 Find e-books' instructions	4/8	1/8	3/8
N4 Find a multilingual library	1/8	5/8	2/8
N5 Find on-line movies	3/8	0	5/8

2 Table. Rates of Success, Failure and Partial Success for all task performed by 8 respondents

Thus, the “Effectiveness” as a part of the common usability of a website could be described based on performance metrics and expressed as percentage of tasks completed successfully. The metric “Success Rate” describes it in numbers. (Nielsen 2001). The

success rate (SR) of the Helmet website could be presented with the following formula  $SR = (16 + (15 * 0,5)) / 40 = 59\%$ , where in total, 40 attempts to perform the tasks were observed, 16 of those attempts were successful and 15 were partially successful.

Jacob Nielsen defines user success rate as percentage of tasks that users complete correctly. He notices that this is a coarse metric, because it says nothing about why users fail or how well they perform the tasks they did complete. However, he adds that “success rates are best used to provide a general picture of how your site supports users and how much improvement is needed to make the site really work.” (Nielsen 2001). He warns not get to be too focused on the details of such numbers, especially if there are a small number of observations and a rough estimate of partial success scores. Observations of confusions during performing the tasks (how many users got confused during the task) and number of confusions also could provide a significant information for designers and developers to improve the interface. These aspects are described in detail in the next section.

## 7.2 Navigation paths and analysis

To make the perception of the following text easier, the author suggested to look at the Helmet homepage and its navigation elements first, as they were used broadly in the following text of analysis.

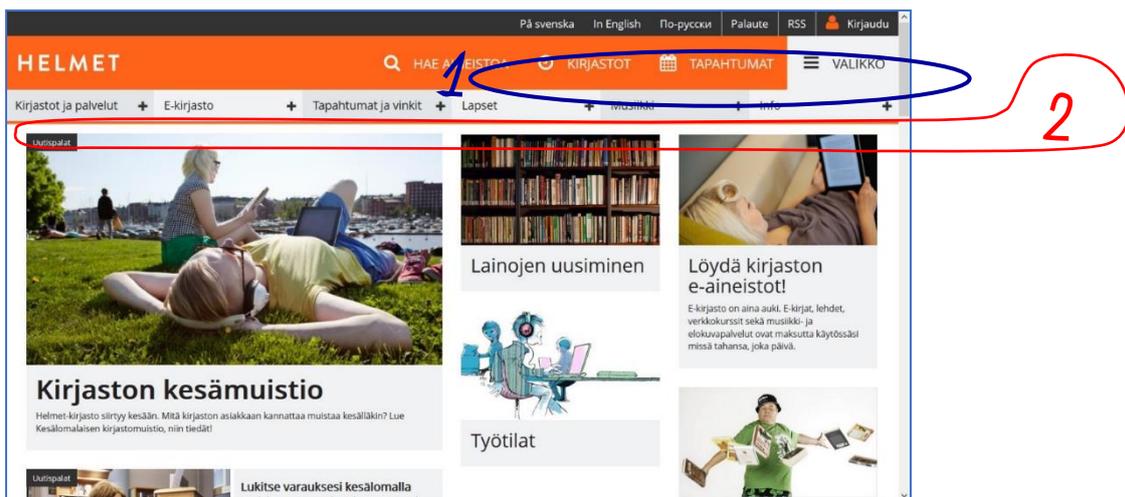


Figure 7. Helmet homepage and navigation menus

Orange menu (1) contained: Hae ainestoja/ Search Item; Kirjastot/ Libraries; Tapahtumat/ Events. Gray menu (2) contained: Kirjastot ja palvelut/ Libraries & Services; E-Kirjasto/ E-library; Tapahtumat ja vinkit/ Events & Hints; Lapset/ Kids, Musiikki/ Music; Info; Vallikko/ Menu.

**Task# 1 Find a book**

7 of 8 respondents approached directly to searching books task and performed task successfully. Common pattern was “Click on Item Search Box – get a result”.

1 respondent of 8 did not use Item Search Box, because she was looking for e-book in E-library section.

<p><b>Task # 1 Find a book</b> Navigation (actions) path description.</p>	
<p><b>Performed optimal navigation path for this task</b></p>	<p><b>Optimal navigation path for this task according to the website structure</b></p>
<p>Click on Item Search Box. Puts a cursor in Item Search Box. Types the author' name in Item Search Box. Click. Appear in the Catalogue (Leaves the website). Choose the book with clicking. <b>Success</b> <i>Problem with the coming back to the Helmet home page (<a href="http://www.helmet.fi/fin">http://www.helmet.fi/fin</a>), tries to use the logo on the Catalogue site for that (logo leads to the Catalogue site's home page (<a href="http://haku.helmet.fi/iii/encore/?lang=fin">http://haku.helmet.fi/iii/encore/?lang=fin</a>)).</i></p>	<p>Open the Helmet website, put into the search box the name of a book, writer's. Press the "eye-glass" to start searching. Get a list of items. Click on the necessary book and get the details about it.</p>

**Key findings and analysis:** the direct and the shortest navigation path to perform the task# 1 was found easily by almost all respondents. It was noticed that 6 of 8 respondents tried to use Helmet Logo on the Catalogue website

(<http://haku.helmet.fi/iii/encore/?lang=fin>) as a way to come back on the home page of Helmet website (<http://www.helmet.fi/fi-FI>). So, the pattern of mistaken usage of Helmet Logo was noticed.

Perhaps, there were two reasons for this. The first one was that users did not understand that they were moved to another website in the same window after clicking “Search” button. The second reason was that users had had the experience with logo navigation tool on other websites. According to the usability guidelines, usually logo on websites works as a home page button. Finally, the combination of these issues could lead to the confusing user experiences and misunderstanding.

### **Task # 2 Find an event**

6 respondents of 8 performed task successfully, where 5 of these 6 coped with the task with partial success and only 1 totally successfully. 2 respondents failed, where one found the wrong page, and another one gave up.

1 user (U11) from successful group tried to use “Tapahtumat ja Vinkint” in Grey Horizontal Menu. His attempts to use this page failed. Finally, he used the optimal navigation path “Kirjastot” (Libraries) in Orange Menu” successfully. 1 respondent (U7) from successful group used tried to use information from sections “Tapahtumat ja Vinkint”, but could not find the necessary event. Finally, find a Web Search Box at the bottom of the page and found the result using this search navigation tool. 1 respondent (U6) from successful group used “Kirjastot ja palvelut” (Libraries and Services) section after several failed attempts to use “Tapahtumat ja Vinkint” page, found on “Kirjastot ja palvelut” (Libraries and Services) page Pasila Library’s Banner and found there Tapahtumat (Events) button. 2 respondents (U5, U10) from successful group used tried to use information from sections “Tapahtumat ja Vinkint” and “Kirjastot ja Palvelut” in Grey Horizontal Menu, however, these attempts were unsuccessful. Finally, they used the optimal navigation path “Kirjastot” (Libraries) in Orange Menu” successfully. In addition, there was only one person who clicked on “Tapahtumat” (Events) button in Orange Menu. Nobody else used it during the task.

<b>Task # 2 Find an event</b>	
Navigation (actions) paths descriptions.	
<b>Performed optimal navigation path for this task</b>	<b>Optimal navigation path for this task according to the website structure</b>
<p>Click on “Kirjastot” (Libraries) in Orange Menu. Open the “Card of a Library” with Filter of Libraries, and with body of the home page below.</p> <p>Click on the Filter of Libraries. Scrolls down the list of libraries.</p> <p>Click on Pasilan kirjasto. Opens ”Card of Pasila Library”.</p> <p>Click on the link ”Siirry kirjaston sivulle” on the Card. Appear on the Pasila Library page.</p> <p>Scroll down and up the page.</p> <p>Click on “Tapahtumat” in Vertical Left Menu. Appear on the “Tapahtumat” page.</p> <p>Scroll down the page.</p> <p>Click on the banner “Kielikahvila Suoma” on the page bogy. Appears on the page “Kielikahvila Suoma”</p> <p><b>Success</b></p>	<p>1) Find an Orange menu, click on the button "Tapahtumat" (Events). System shows the page with the coming 4 events as a set of pictures and the link "Näytä lisää" (show more)/ or Use the filter “Kaikki kirjastot” under the button "Tapahtumat" (Events) to choose the library that you need.</p> <p>2) Find the Grey horizontal menu and tap "Tapahtumat ja vinkit" (Events and hints). System shows the coming 4 events as a list. The first one is the biggest, in the end of the list there is a link "Näytä kaikki" (show all).</p> <p>3) Find the block of coming events on the main page. Click the link “Tapahtumat” on the picture of an event or to the link "Näytä kaikki" (show all).</p>

**Key findings and analysis:** the optimal navigation path (“Kirjastot”/ Libraries) navigation tool in Orange Menu) to perform the task# 2 was found easily only by 1 respondent (U12). The “Tapahtumat” (Events) button in Orange Menu was used by only 2 respondents.

According to the data, there were difficulties for respondents in using in Tapahtumat (Events) Filters Zone (navigation tools: Search Box “Hae tapahtumia valitusta kirjastosta” (Find an event in a chosen library) and Filter of Libraries). The users rarely used the navigation tool “Tapahtumat” (Events) in Orange Menu, and when they used it they

used it incorrectly and could not correct their mistakes and get the necessary information. 3 respondents who used such search tools as: “Search Box” “Hae tapahtumia valitusta kirjastosta” (Find an event in a chosen library), “Filter of Libraries” and “Filter of Services” made two types of mistakes. These respondents did not understand how the Filters work, what searching results they provided. So, they used the specific search boxes wrongly. Hints inside search boxes did not help. The results of search did not explain what was wrong and how to correct the searching method to get the relevant results.

The possible reasons why the respondents did not use Orange menu (Orange libraries and Orange events) was that this menu did not seem to be a clickable one with clickable icons. So, people preferred to use Grey Horizontal Menu to be sure that this navigation tool led them to the demanded information. According to the eye tracking data, the buttons with almost the same names in the Grey menu and Orange menu (i.e. “Orange Events” and “Grey Events and hints”; “Orange Libraries” and “Grey Libraries and Services”) were noticed by the users. Sometimes the “Grey Events and hints” was noticed even earlier than the analogous button “Orange Events”. However, more mouse clicks were recorded on the “Grey Events and Hints” button. It could mean that both menus attracted users’ attention and made them spend more time on the home page, but the “Orange menu” did not considered by people as a right way to navigate further despite almost the same labels.

### **Task # 3 Find e-books’ instructions**

7 respondents of 8 performed task successfully, where 4 of 7 were totally successful and 3 respondents of 7 completed the task with a partial success. 1 respondent failed and got the wrong result.

3 respondents used the direct and the shortest (optimal) navigation path for doing this task (look at the description table below). 2 respondents used as the 1<sup>st</sup> navigation tool for performing this task a banner “Tasku Kirjasto” (Pocket Library) on the home page.

1 respondent used the Bottom Menu and E-Kirjasto (E-Library) link there. 1 respondent used as the 1<sup>st</sup> navigation tool for performing this task “Info” section in Grey Horizontal Menu and then its subsection “Library outside library” (Kun et pääse kirjastoon). The

respondent who got the wrong result used the correct navigation path (starting with the E-library in the Grey Horizontal menu), but then stopped on the wrong final page.

<b>Task # 3 Find e-books' instructions</b>	
Navigation (actions) paths descriptions	
<b>Performed optimal navigation path for this task</b>	<b>Optimal navigation path for this task according to the website structure</b>
<p>Click on the E-library in the Grey Horizontal menu\ or on a banner “Tasku Kirjasto” (Pocket Library) on the home page. Appear on the E-library page.</p> <p>Click on “Ohjeet” (Instructions) in Vertical Left menu. Appear on the Ohjeet page.</p> <p>Click on the banner “Ohjeet e-kirjapalveluihin”. Appear on the Ohjeet e-kirjapalveluihin page.</p> <p><b>Success</b></p>	<p>Find the grey horizontal menu (valiko menu), click the button "E-Kirjasto" (open mode of the grey menu). The system shows the common page with Vertical Left Menu with e-library services: books, films, courses, magazines, databases, instructions.</p> <p>Press on “Instruction” button in Vertical Left Menu. Or to press on the “Kirjat” button in Vertical Left Menu and on the opened page choose a banner “Ohjeet” (Instructions).</p>

**Key findings and analysis:**

5 respondents found the possible optimal paths to perform the task successfully, using Grey Horizontal Menu or extra navigation tools as a banner on the websites' home page. In addition, some users found other less direct paths which nevertheless allowed them to finish the task successfully.

According to the data described above, it could be concluded that the “Grey Horizontal Menu” with the tab “E-library” worked for the users with this task perfectly. However, some of the respondents also used the “banners” navigation path, clicking on the banner on the home page. Hence, it is beneficial for the website to have both navigation paths.

#### **Task # 4 Find which library houses a collection of books in foreign languages**

1 respondent (U12) completed the task successfully. The Web Search Box was used by a respondent as a tool to reach the goal (Web Search Box was found in Subsection “Webpage Search” in “Info”). 2 (U7, U8) respondents completed the task with partly success. 5 (U5, U6, U9-U11) respondents gave up, because could not find the demanded information.

#### **Key findings and analysis**

The pattern of unsuccessful path was discovered in analysis. Respondents tried to use Item Search Box for general searching on the web site, got the inappropriate results and gave up.

The second aspect which was noticed was that the respondents who failed in this task tried to find the necessary information in “Libraries and Services” section and used filters for Services there. Another section used was “Info”, its subsection “How to find information”).

What the reason could be behind these results? The respondents admitted that the task was challenging for them, they tried to come up with the strategies where they should find the required information. So, therefore they started from the section “Libraries and Services” and tried to use Service filters there, considering the “big collection of books in foreign languages” as an extra service. However, the list of the Services in the filter was too long and confusing for the users. It contained a lot of items of all Helmet libraries in different languages (Finnish, Swedish, English), and people just gave up to find anything useful there. Thus, the system was confusing in this case and demanded to many resources from the users.

The second used strategy was to use the search tool. It seemed to be very logical idea to approach this task, however, the respondents did not notice that Helmet website had two different Search Boxes. So, the respondents tried to use Item Search Box for searching information on the Helmet website. It should be stressed that the hints inside the Search Boxes (what information should be put it) did not help people and were not understood by the users. Thus, it was a typical and crucial mistake for getting relevant results. The page with irrelevant results did not give people a key what was wrong with their request and what should be changed to get the desired result.

To conclude, the Search Tools (Search boxes) are very significant navigation instruments on big websites, especially on the library's site due to its specification. The research showed three problematic aspects with these tools. The first one was that people could not find easily the Web Search Box on the website. The second issue was that people understood incorrectly what the Item Search Box's function was and used it as the Web Search Box. Hints in the Search Boxes did not help the respondents to understand what exactly the search tools' function was: to search on the website or in the Catalogue. The third difficulty was that the respondents did not understand how to correct, to change their actions to get the right result, because the Item search tool gave only zero result to the user in the case of "wrong" request (with misspelling, or if there is no such information). There were no hints or guidelines what could be a reason for the zero result and what could be corrected in the request. So, the learnability of the website did not work for the users in this case.

#### **Task # 5 Find a collection of on-line movies**

3 of 8 performed task successfully. The users approached "E-library" directly (clicking on the word or "+" sign) in Grey Horizontal Menu. 5 of 8 performed the task with a partial success, 3 of them used the same way as full successful group. 1 respondent from these 4 used the banner "Löydä kirjaston e-ainestot" on the home page as a way to "Elokuvat" page (in E-library section).

<b>Task # 5 Find a collection of on-line movies</b>	
Navigation (actions) paths descriptions	
<b>Performed optimal navigation path for this task</b>	<b>Optimal navigation path for this task according to the website structure</b>
<p>Click on “E-library” in Grey Horizontal Menu. Appears on “E-library” page</p> <p>Click on the Films (Elokuvat) / Click on + sign of “E-library” in Grey Horizontal Menu. Open drop down menu of E-library. Appear on the page Elokuvat in the E-kirjasto.</p> <p>Scan the page. Click on the banner “InstantFix-elokuvapalvelu”. <b>Success</b></p> <p>Click on the banner “IndieFlix on nyt InstantFix”. <b>Partly Success</b></p>	<p>Find “E-library”button in Grey Horizontal Menu and click on it.</p> <p>Click on the Films (Elokuvat) / Clicks on + sign of “E-library” in Grey Horizontal Menu. Click on the banner “InstantFix-elokuvapalvelu” on the page Elokuvat in the E-kirjasto</p>

**Key findings and analysis:** the direct and the shortest navigation path to perform the task# 5 were found by 6 from 8 respondents.

Recorded data showed that the “Grey Horizontal Menu” with the tab “E-library” worked for the users with this task about online-services perfectly. As it was noticed in the task#3 “Find e-books’ instructions”, some of the respondents also used the “banners” navigation path, clicking on the banner on the home page. Thus, it could be said that it is beneficial for the website to have both navigation paths.

### **7.3 Most common trends in usability study: navigation tools**

#### **7.3.1 Navigation tools that are easily seen and used**

According to the analysis of users’ fixations and usage of navigation tools there were three main group of navigation tools that users preferred to apply. They were: 1) Hori-

zontal and Vertical menus (pic. 1); 2) Horizontal and Banners menus; 3) Bottom menu (pic 3).

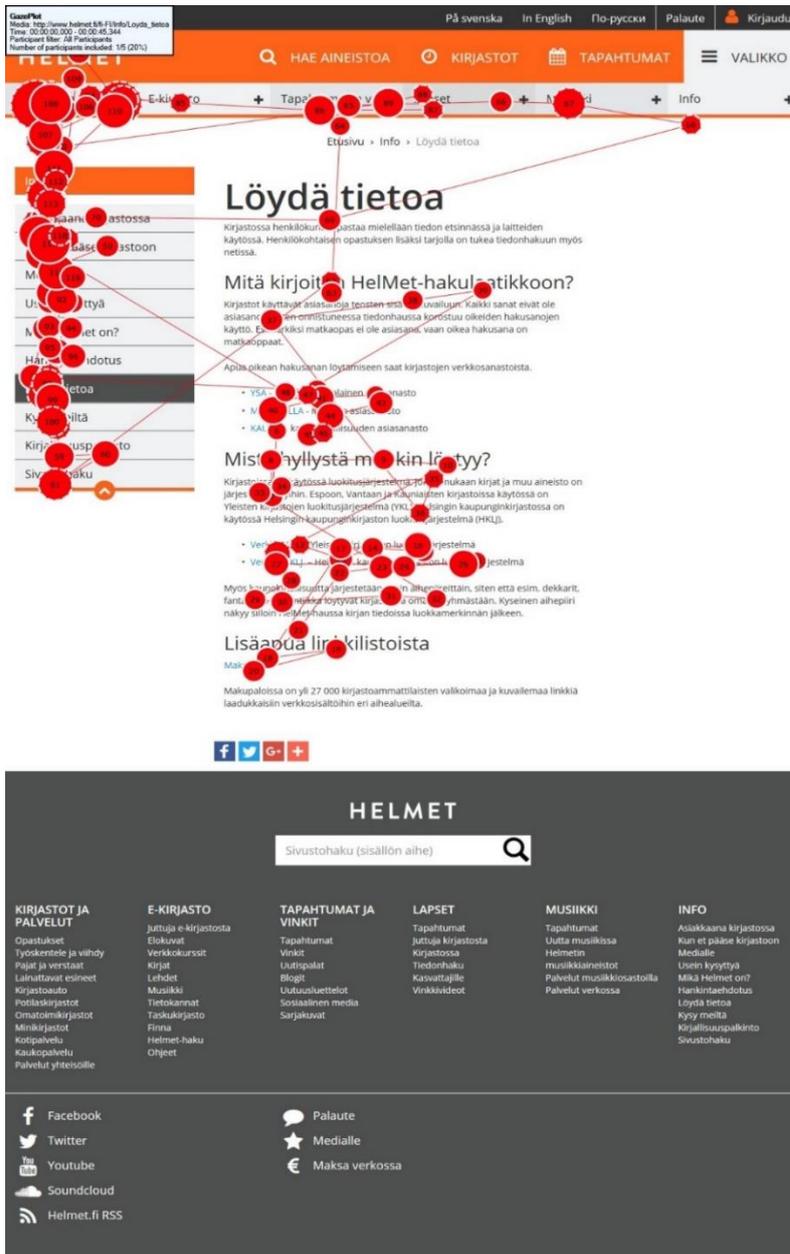


Figure 8. Example: usage of the Horizontal and Vertical menus by the respondent U6 (pic.1)



Figure 9. Example: usage of the Horizontal and Banners menus by the respondents U6 (red color) and U9 (violet color) (pic 2).



Based on this data it could be concluded that the existence of three different groups of navigation tools supported the users' actions no matter which one of the three was preferred.

### 7.3.2 Navigation tools that cause confusion and errors

#### “Item Search Box” and “Web Search Box”

The research showed that the respondents did not notice that Helmet website and the Catalogue were two different sites (systems) with their own separate Search Boxes. So, the respondents tried to use Item Search Box for searching information on the Helmet website. It was a typical and crucial error in the way of getting relevant results. The page with irrelevant results did not give people a hint what was wrong with their request and what should be changed. Thus, the reasons why it happened were users did not notice that Item Search Box (at the top of the page) was a search tool only for the Catalogue, not for the website. It should be stressed that the hints inside the Search Boxes (what information should be put it) did not help people and were not understood by the users. The part of those respondents who noticed Web Search Box at the bottom did not realize that this search box differed from the Search Box on the top of the webpage. The other part of those respondents who noticed Web Search Box at the bottom and used it, confirmed in interviews that they did it accidentally, not because they realized that those search boxes had distinct functions.

The respondents' quotations from the post-test interviews below illustrates this discovery.

**User 5** “- *Web Search Box? I didn't notice. Ok, wow! It wasn't clear (two search boxes are different). Good to know. Thanks!*”

**User 8** “- *Web Search Box? I have not noticed this search box here, it's in a wrong place. Or maybe it should be some information on the top page, if you are looking something on the website go down. Obviously, I don't have anything against the Web search box, but the place is a bit strange. It's good to have some info like hint that you have to go down the page to use the web search. Well, its location is not so good.*”

**User 10** “*Design is quite good, search for other things could be simpler. Web Search Box could be higher, I was confused...*”

**User 11** “Maybe the search for the site, not only for books. Usually I use it. The search for the whole website. ..Eeeehh, wow it is here! It’s not the terrible place, but the thing that I did not see it. Usually the web search on the top part. But it could be too confusing. So, I don’t know.”

**User 12** “Yes, I was trying to find on-line moves here (showed the “Items Search Box”). It’s very confusing to me why?”

In addition, the analysis of Areas of Interest was conducted to check if the users looked at the Item Search Box and Web Search Box on the home page and if they clicked on them. The tables below present the fact that compared to the “Item Search Box” at the top of the home webpage, the “Web Search Box” at the bottom took much longer to notice, or was not noticed at all.

### Time to First Fixation

At the home page	Items Search Box	Items Search Box	Web Search Box	Web Search Box
	N rec. (count)	Sum (sec)	N rec (count)	Sum (sec)
U8	1	21,22	-	-
U5	1	12,11	1	152,23
U9	1	0,15	-	-
U11	1	6,13	-	-
U7	1	1,59	1	99,69
U12	1	5,53	-	-
U10	-	-	-	-
U6	1	6,77	-	-
All recordings	7	53,49	2	251,92

3 Table. Time to First Fixation on the Search boxes. Only 2 persons noticed the Web Search Box on the home page.

Only two respondents (U5 and U7) noticed Web Search Box at the bottom of the home page. It happened in more than 99 seconds after beginning to explore the home page. In comparison, 7 respondents of 8 noticed the Item Search Box on the home page in 0,15-21,22 seconds after the start of working on the home page.

### Mouse Click Count

At the home page	Items Search Box	Items Search Box	Web Search Box	Web Search Box
	N rec. (count)	Sum (count)	N rec. (count)	Sum (count)
U8	1	3	1	0
U5	1	3	1	0
U9	1	0	1	0
U11	1	2	1	0
U7	1	1	1	0
U12	1	2	1	0
U10	1	0	1	0
U6	1	1	1	0
All recordings	8	12	8	0

*4 Table: Mouse Click Count. Data about the Clicks on the Search Boxes on the home page*

The table showed that 6 of 8 respondents clicked on the Item Search Box during the test session against the absence of respondents' clicks on Web Search Box.

To sum up, the interviews and eye tracking data confirmed that navigation tools Item Search Box and Web Search Box were perceived by respondents as the same navigation tool that caused errors and confusions when performing the tasks. In addition, Web

Search Box were noticed and used considerably less than Item Search Box, because of its location at the bottom of the home page.

### Helmet Logo button on the Catalogue website

The second noticed confusing aspect was revealed at the Catalogue. The logo of Helmet there was perceived by respondents as a back button to the Helmet website (typically, a standard function of logo at websites nowadays, and a part of natural navigation for users). However, it led to the main page of Catalogue, another site. Nevertheless, this fact was not obvious for the respondents and led to confusions and misunderstanding. The picture below was an example of how the user looked at the main page of Catalogue site. It was seen that there were many fixations on the Helmet logo, but nobody noticed the link of Helmet webpage as a navigation tool to come back to the library's website.

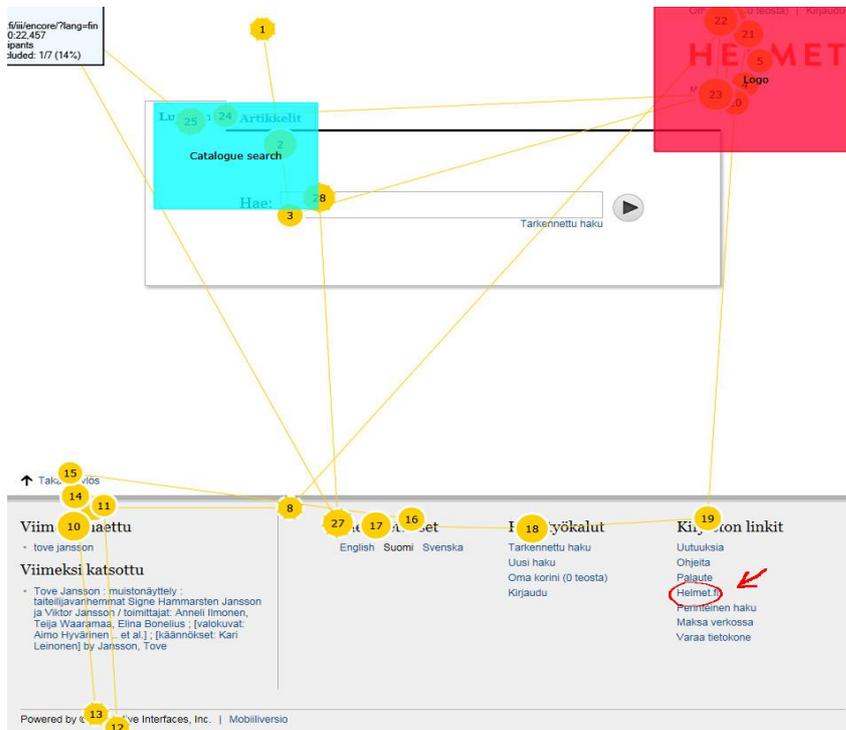


Figure 11. Example of the Fixations on the Helmet Logo in Catalogue website

**Navigation tools: “Grey Events and Hints” and “Orange Events”; “Grey Libraries and Services” and “Orange Libraries”.**

The table below illustrated that the eye tracking system recorded data of 7 respondents of 8 on the home webpage. It could be seen that there were 3 users who noticed the “Grey Events and Hints” earlier than the “Orange Events”, and there were 4 users who perceived “Orange Events” earlier than “Grey Events and Hints”. Some users noticed the “Grey Events and Hints” much earlier, than the orange analogue. Some users had shorter time to the first fixation on the Orange Events. The researcher used these data as an illustration which helped to realize the fact that both navigation tools with almost the same labels attracted the respondents’ attention.

**Time to First Fixation**

At the home page	Events and Hints	Events and Hints	Orange Events	Orange Events
	N rec. (count)	Sum (sec)	N rec. (count)	Sum (sec)
U8	1	2,8	1	18,1
U5	1	11,48	1	9,24
U9	1	3,78	1	4,03
U11	1	2,98	1	1,18
U7	1	3,67	1	20,06
U12	1	0	1	38,3
U10	-	-	-	-
U6	1	6,48	1	5,67
All recordings	7	31,19	7	96,58

*5 Table: Time to First Fixation. Data about the Fixations on the tabs on the home page*

The second thing the researcher was interested in was how often the respondents clicked on those buttons (used those tools). It appeared that the “Grey Events and Hints” tab was used from 1 to 2 times by all the users, i.e. 9 times in total. The “Orange Events” was used only once by one user. (Look at the table below)

### Mouse Click Count

At the home page	Events and Hints	Events and Hints	Orange Events	Orange Events
	N of (count)	Sum (count)	N (count)	Sum (count)
U8	1	1	1	1
U5	1	2	0	0
U9	1	1	0	0
U11	1	1	0	0
U7	1	2	0	0
U12	1	2	0	0
U10	-	-	-	-
U6	0	0	0	0
All recordings	6	9	1	1

6 Table: Mouse Click Count. Data about the Clicks on the tabs on the home page

It could mean that although the respondents noticed the Orange tab, for some reasons they did not consider it as a possible navigation tool, did not use it, and preferred the Grey button. It is interesting that the Orange Events was considered an extra shortest way for the users to get the information about events. However, this design solution was not used by the users in this research.

## “Grey Libraries and Services” and “Orange Libraries”

The next table illustrates in what time users noticed the navigation tools of different colors, but with the similar labels: “Grey Library and Services” and “Orange Libraries”. The eye tracking system recorded data of 7 respondents of 8 on the home webpage.

### Time to First Fixation

At the home page	Grey Lib and Services	Grey Lib and Services	Orange Libraries	Orange Libraries
	N rec. (count)	Sum (sec)	N rec. (count)	Sum (sec)
U8	1	3,03	1	7,93
U5	1	17,65	1	8,49
U9	1	0,63	1	4,36
U11	1	4,07	1	6,4
U7	1	17,76	1	13,11
U12	1	10,96	1	6,09
U10	-	-	-	-
U6	1	21,76	1	7,28
All recordings	7	75,86	7	53,67

7 Table: Time to First Fixation. Data about the Fixations on the tabs on the home page

These data illustrates the fact that both navigation tools with almost the same labels attracted the respondents’ attention. So, people spent time on looking at the both navigation elements. Hence, there was a question: what did the respondents use in the context of the critical tasks if they had two opportunities to act? The table below showed clicks on those navigation tools “Grey Libraries and Services” and “Orange Libraries”.

### Mouse Click Count

At the home page	Lib and Services	Lib and Services	Orange Libraries	Orange Libraries
	N rec. (count)	Sum (count)	N rec. (count)	Sum (count)
U8	1	1	0	0
U5	1	3	1	4
U9	1	1	0	0
U11	1	1	1	2
U7	0	0	0	0
U12	1	3	1	1
U10	-	-	-	-
U6	1	4	0	0
All recordings	6	13	3	7

8 Table: Mouse Click Count. Data about the Clicks on the tabs on the home page

It can be seen from the table that the respondents clicked on the “Grey Libraries and Services” more often than on the “Orange Libraries”. The possible reasons behind it were such issues as a small difference in labeling, or i. e. “clock icon” on the “Orange Libraries”. These features gave extra information to the users, but it was not clear why the “Orange navigation tool” could be more effective in the context of the critical tasks.

User 9 described it this way: “I push here and went to Libraries and Services, but I did not think that they are different. The symbol of time stopped (*next to the word Library on the Orange menu*) from choosing it”.

### 7.3.3 Navigation tools that are not seen and used

It was revealed that not all navigation tools were noticed and used by users. For example, such navigation tools as “Bread crumbs” on different pages and the extra links in the lists of Events “Show all” got almost no fixations from the users.

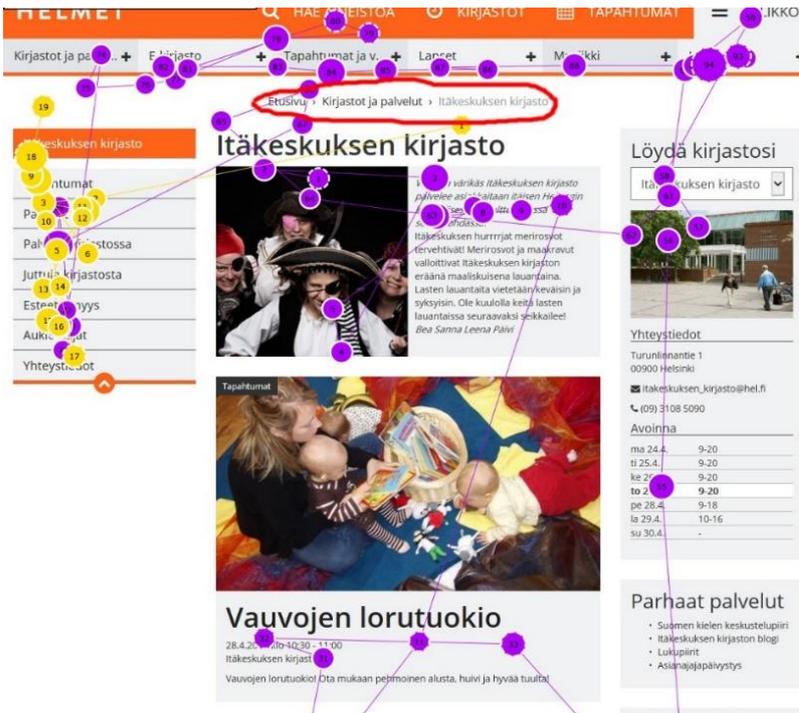


Figure 12. Example of navigation tool “Bread crumbs” (Näytä kaikki”) which were not seen by U7 (purple color).

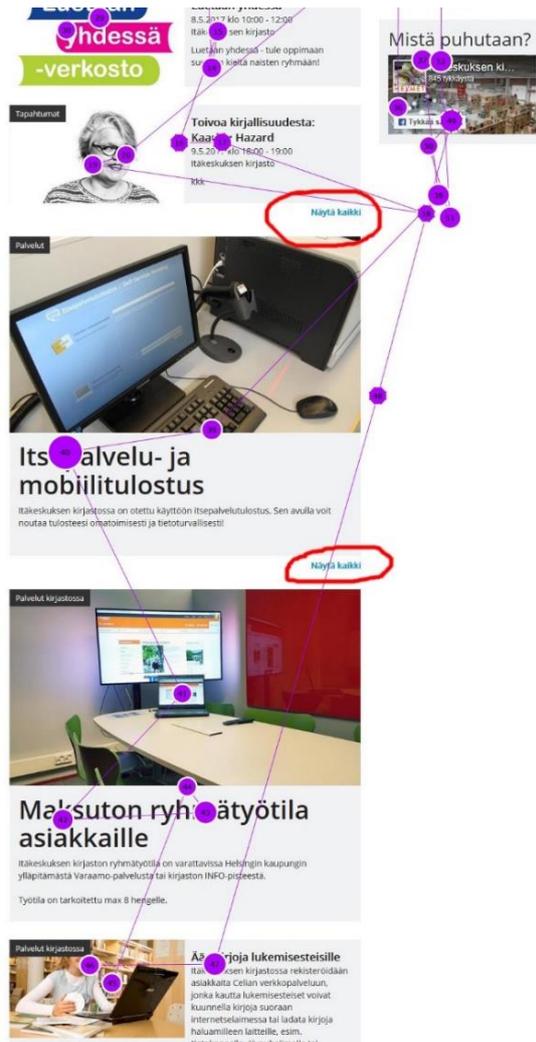


Figure 13. Example of navigation tool “Show all” (Näytä kaikki”) which were not seen by U7 (purple color).

The picture above illustrated that the respondent U7 did not look at the links “Show all”, the extra navigation tools (there were no fixation there), which help to go deeper to the whole list of events in the libraries. This tool could be useful in the context of such tasks as finding an event (Task# 2), however it stayed useless during the test session.

The probable reason for that is, perhaps, related to the users’ impression about the home and some internal pages of the website. The respondents assessed them as too overloaded and complicated, because of plenty of different information. To support this idea we refer to quotations of the respondents’ answers.

**User 7** “- Looks as tones of information. If you scroll down, I find it too much info on the 1st page, so I get bored. For example, I’m not interested in libraries news (like Libraries innovations), I’m interested in some material interesting for me, not news. News does not fill the bill for me. Events are a little bit more interesting.”

**User 12** “- *Quite clear, but so much information to get lost here. It divided into so many things here, yeah. For me it's finding the path, where I'm looking for. It's overwhelming. The first page is like a puzzle has a lot of things. And everything is kinda jumping on me, something are about book, something are about happenings, something are else. The biggest problem for me the front page is so... so much things are going on, so I can't use any one. – I'm just thinking, where am I?*”

## **8 ANALYSIS OF PHASE 3: ASSESSMENT AND DISCUSSION OF USER EXPERIENCE**

The post-test interviews analysis revealed the users' assessment of navigation system, its simplicity and usefulness, feelings about users' navigation experience and common expectations towards the website of Helsinki public libraries. The post-test interview contained a set of the demographic questions, 6 statements about actions, self-corrections, feelings (Likert scale) and 4 open-ended questions to get a general feedback and respondents' opinions about problematic situations when completing the tasks in a free form (Appendix D).

The table below illustrates how people assessed their experience with the website, answering 6 questions and using the scale of grades from “strongly agree” to “strongly disagree”. In case of the 6<sup>th</sup> statement the options for answer were from “very confident” to “absolutely unconfident”.

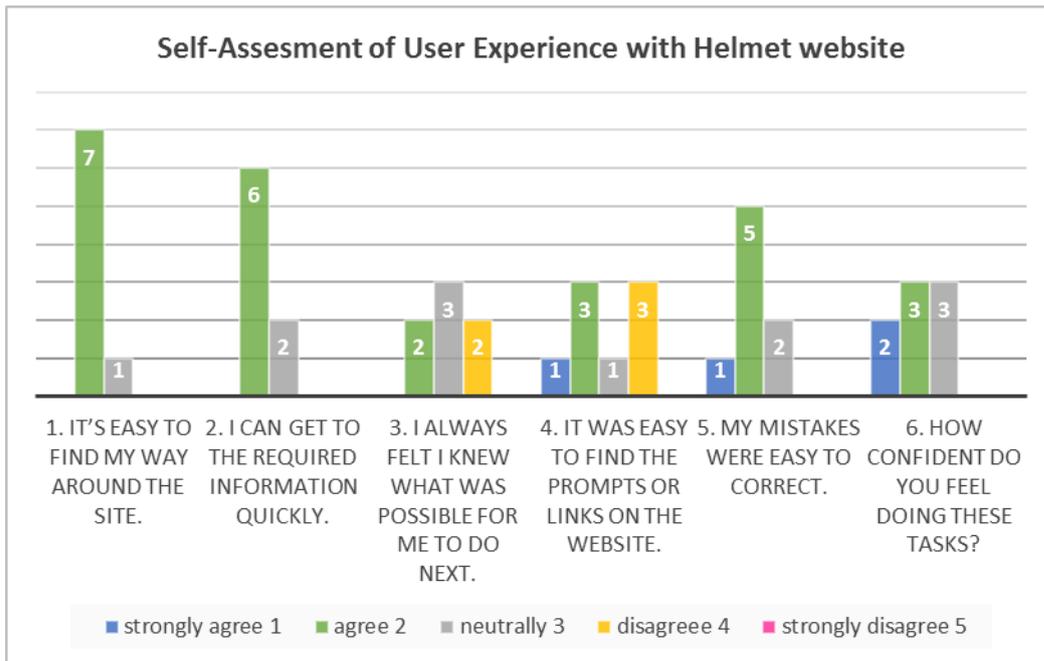


Figure 14. Self-Assesment of User Experience with Helmet website.

It appeared that 7 respondents of 8 stated that they agreed that it was easy to find their way around the website. However, 3 respondents chose “agree” and 3 others chose “disagree” when asked if it was easy to find the prompts or links on the website. The statement #3 “I could always feel what was possible for me to do next” was also assessed differently by the respondents. 2 of 8 participants agreed with statement, 2 of 8 – disagreed and 3 of 8 chose the answer “neutrally”.

To conclude, it appeared that people perceived the website as an easily navigated system and were sure that they could perform the tasks successfully – even if they were unable to perform some of the tasks. Nevertheless, people assessed differently their feelings about easiness to find the prompts and links on the website and comprehension about the next steps in the orientating on the webpage. Perhaps, the reason behind that were in the simple, neutral design of the website which made an effect of ease first impression. However, more detailed and complex tasks (such as #2 and #4) showed that the system could not efficiently support mistaken users’ actions and provide them with corresponding feedback to correct their behavior. This was observed during tests and the respondents confirmed this fact while the post-reflection interviews. The same fact was noticed in other usability studies: users’ confidence can vary as they search infor-

mation (Carol Kuhlthau,). As discussed in an earlier section, she showed that visitors may be optimistic at the beginning, but as they progress and face with more information, their confidence may dip.

Thematic analysis, a method which searches for the central themes immersed in the texts of interviews (Coolican 2014), allowed the author to explore the themes standing behind the text and showed them through the respondents' quotations. In results, three key themes were discovered: 1) "neutral design", 2) "easiness to use", 3) "puzzling". The theme "*Neutral design*" reflected the respondents attitude and perception towards the Helmet website design. It was described by all the participants with help of neutral adjectives. The quotations about design were following: "*I like it. It's pretty clear*"; "*It's pretty simple*"; "*It looks ok, neutral, like library one*"; "*Design is quite good*", "*Quite clear*". There was a different notion, emotionally more negative, than neutral, only from one participant. "*It feels pretty toxic on the eyes.*" - said the respondent.

The second emerged theme, called by the author "*Easiness to use*", included the respondents' descriptions of their expectations and impressions of the navigating and orientating on the website. Generally, people assessed the website as an easy navigation system.

These quotations expressed the people opinions: "*The menus are logical. They could be more natural, now it's confusing. Libraries and services (section) taken too long.*"; "*Everything is big, big fonts. Looks really it's easy to use.*"; "*It's pretty simple, it was quite easy to find around*"; "*It's logical, they don't try to mix my head.*"

The last emerged theme was titled "Puzzling". It included two main ideas heard from the participants: the first one was about the "overwhelming" nature of the Helmet website (especially it concerned the homepage), and the second one reflected the people mindsets about such institution as a library and its services in the modern life in Helsinki. The quotations below illustrated the theme "Puzzling" with stress on the idea of Helmet homepage being overwhelming.

"- *Looks as tons of information. If you scroll down, I find it too much info on the 1<sup>st</sup> page, so I get bored. For example, I'm not interested in libraries news (like Libraries innovations), I'm interested in some material interesting for me, not news. News does not fill the bill for me. Events are a little bit more interesting.*"

"- *Quite clear, but so much information to get lost here. It divided into so many things*

*here, yeah. For me it's finding the path, where I'm looking for. It's overwhelming. The first page is like a puzzle has a lot of things."*

*- The biggest problem for me... the front page is so... so much things are going on, so I can't use any one. I'm just thinking, where am I?"*

The second idea reflected in the emerged "Puzzling" theme revealed that people just skipped the Helmet homepage out, because of its overloading with unfamiliar information and used the website for the basic library's users' needs, i.e. borrowing books or e-books. One respondent even noticed that there was no information on the Helmet homepage that would stress out that this is a library site. However, the possible bigger problem hidden behind this discovery was the existence of an information gap between what people believe Helmet is and what it actually is. The following quotations should be considered to support the authors' argumentation.

*"- My experience from libraries: go there, borrow books and leave it to read home. But now they have karaoke, cool. It's good that they have events."*

*"- The clarity, what they want to be. Is it a library or somethings else?"*

*"- I don't know about the news, on lib website I'm looking only info about books, all old fashion things. It's a place where you should be quiet."*

In this author's opinion, the discovered picture of users' knowledge and attitude towards the Helmet website reminds of Ruth Connel's words about libraries' sites: "A library website is an integral part of a library's identity. Many customers visit a library website, more than they visit its physical location. Websites function as portals for research, marketing tools, and places for information about libraries" (Connell 2008). This notion could become a bright illustration to describe the possible goals and direction of the Helmet website further development, focusing on the users, their aims and tasks.

## 9 RECOMMENDATIONS

Answering the research sub-question “In what ways may the Helmet website be improved to enhance the user experience?”, the following recommendations were produced, based on the findings of the distinct research phases mentioned in this study (see Chapters 6 - 8). The set of recommendations has been divided into four groups:

### **Recommendations:**

- 1. The first group concerns items that do not require correction: The E-library section** and navigation inside this part of the website work efficiently and this section does not require revision.
- 2. The second group of recommendations** concerns issues that can be fixed relatively quickly and with only minor changes to the website. Fixing these issues, however, could sometimes make user experience a lot more productive and pleasant. Specifically, the following is recommended:
  - **The “Search Results” pages** should provide the user with hints in the case the search has given no results, e.g., as a result of misspelling. There could be prompts from the system how to move forward, e.g., how to correct and continue the search to get the desired result. This concerns the search on the Helmet website, on the Catalogue site and in the Event section. This would stress the supporting aspect of the search function.
  - **Drop-down lists** in section “Libraries and Services” should be reviewed in terms of how much information they provide for the user per time, as the current list is too long and made the users struggle and eventually give up (see Chapters 7-8). One possible solution could be to group the information, e.g. to divide the list of all libraries according to city (Helsinki, Espoo, etc.).
  - The above-mentioned drop-down lists could be amended with additional navigation tools, e.g. **“Map of libraries”**. This way of visualization was reported by the respondents as more convenient for searching and choosing a library to visit.
  - **Filters in section “Events”**. This tool should be tested more thoroughly, and possibly revised, as the users had difficulty using them.
- 3. The third group of recommendations** concerns more essential changes that would demand considerable time and resources to implement. Specifically, this includes:

- The **navigation between Helmet (helmet.fi) and Catalogue (haku.helmet.fi) websites** should be made more transparent. In particular, many respondents did not notice that after entering a searching word in the “Item Search Box” in the Helmet site they were moved to the Catalogue site. Moreover, they could not come back to the Helmet website by clicking on the Helmet logo as on a standard navigation tool leading to the main page, because it brought them to the Catalogue website homepage.
- The coexistence of **two separate search tools**, the Catalogue Item search and the Helmet website search, should be addressed. On the one hand, the research suggests that this causes confusion and mistakes in user experience. On the other hand, the participants confirmed that the use of web search box is critical for them in such a big system as Helmet website. One possible solution, on the level of the interface only, could include the relocation of web search box and correction of prefilled hints in the search boxes. An alternative idea would be to merge the two search tools, as implemented by some libraries systems in other countries. For example, the part of Russian public libraries in St-Petersburg has this realization of the search system (<http://kr-cbs.ru/>). New York public library has a common search box with switch button between web and catalogue systems (<https://www.nypl.org/>). The network of public libraries in Stockholm “City of Stockholm Libraries” presents a common search box and provides the results in two categories “web” and “catalogue” (<https://biblioteket.stockholm.se/>). In the author’s point of view, the second solution is preferable. However, it could be quite challenging in the Helmet case, because the both systems are too big and searching results, perhaps, could not be presented together clearly and simply for the users. Any solution should be done and tested very carefully, to avoid creating room for more confusion.
- The priorities of **website’s mobile version** versus **desktop version** should be defined. The nature of the devices, user behavior and usage context, navigation patterns are quite different in the two cases. Therefore, the existing adaptive mobile version is arguably not ideal for the desktop users which currently constitute 67% of all users of Helmet website (Soininen 2016). It would make sense to develop two separate versions with the common content management system, i.e. CRM, because of the nature of the devices, user behavior and usage context,

where navigation patterns are different. In case if the mobile version is developed, it is recommended to provide “mobile users” with the opportunity to choose mobile or web version to work with. Summarizing, two versions of the website would give much more freedom from the perspective of media management to deliver the content successfully to the customers.

**4. The fourth group of recommendations** focuses on the strategy of the Helmet libraries development in general.

- According to the data (see the Chapters 6 and 8), there is a tangible information gap between Helmet library network and the citizens. On the one hand, Helmet has a wide set of very different services (starting from the books and e-books, and ending with educational courses and entertainment events), on the other hand the respondents still have a typical “old-school” mindset about the Helmet library as only a quiet place for borrowing books (or e-books on the website). Moreover, when participants found out about the many different “not typical” services, they reacted differently. There were people who felt very enthusiastic about this fact, but others faced this information on the website and were confused, not understanding whether they were still on the library website. So, it seems that the Helmet administration should work to clarify Helmet’s modern positioning for the customers: is it a library with the functions of social educational and entertainment center, for example, or something else? The libraries’ less traditional functions should be promoted in a detailed, more active way, beyond the website and Facebook group. The next recommendation in a close relationship with the previous one: the layout of Helmet homepage. According to the collected data and analysis, now the Helmet homepage does not match the users’ needs and expectations and contains too much information that negatively affects the user experience. The author would recommend re-building the homepage based on the users’ key interests and tasks (see Section 5.4.4 and 6, 8). For instance, it was reported that the events are more interesting content for some people than library news. In addition, one may consider reducing the number of information units on the homepage. Too many units of very different nature may contribute to the “puzzling effect”. However, it would be reasonable to conduct an extended customer opinion research to get a more detailed picture about public library users’ needs and interests in Metropolitan area. In the au-

thor's opinion, the Helmet website offers a wide field for future studies with a goal to get deeper understanding of library user experience. The possible directions of research could be the usability of mobile version of library websites, the modern library services consumption, the public libraries' user groups and their behavior on the website.

## 10 CONCLUDING REMARKS

Originally, the notion of usability in information technologies was understood as "user friendliness" (Dehnig as cited in Harvey & Stanton 2013: 18). Later, the focus moved to the aspects of "effectiveness, efficiency and satisfaction in a specified context of use" (International Organization for Standardization ISO 9241 210:2010, 2.13). Reflecting on this development, the present thesis demonstrated that despite the visually positive impression the Helmet website made on the respondents, people had difficulties performing basic search tasks. This indicates that in the process of website design and further development, the usability aspects might not have been always addressed properly (see the Results and Analysis in Chapters 7-8).

The research highlighted the problem of evaluating usability of the Helmet website by exploring the user experience. The stress was made on navigation paths and tools. To address the problem, we formulated three research questions. The first one was the following: "How well informed is the public about online and offline services offered by the Helmet Library?"

The pilot survey has shown that while some of library services were well known and important for the respondents (e.g. "Using of multi-language library, i.e. borrowing books written in different languages", "Reading e-magazines and/ or e-books anywhere using Helmet account"), there were also services unknown to most respondents. Importantly, some little-known services were marked as very attractive once the respondents learned about them; an example of this is the service "Free movies on InstantFlix anywhere, using Helmet account". This spring (2017), the service was cancelled by Helmet administration because of low demand; however, the present research suggests

that the reason might have been a lack of awareness and promotion, not a lack of interest from the users.

The results of the survey may serve as a guide for the Helmet library, indicating which services need additional promotion and advertisement, and which are worth developing further. As for the website, it is recommended that user needs and interests in the library services are taken in consideration more actively. It would allow to create relevant content, to build stronger relationship with the customers and provide the correct content delivery with focus on the usability demands.

The second research question concerned the website navigation system and user experience when performing the tasks specific for the Helmet website. The common navigation paths were found for most of the tasks, however for Task 4 (“Find which library houses a collection of books in foreign languages”) the participants used different navigation paths and tools. This task was accomplished successfully by one user only. The data about performing this task revealed a number of usability issues. The biggest one turned out to be a location and work of “item search box” and “web search box”. The study showed that the participants used such navigation tools as horizontal, vertical menus, banners menus, bottom menu. Some navigation elements, such as “item search box” and logo in the Helmet Catalogue, were used with errors.

According to the data, the respondents perceived the website as an easily navigated system and were sure that they could perform the tasks successfully – even if, they failed some of the tasks. However, people felt quite differently about how easy it was to find the prompts and links, and how obvious were the next steps when navigating the website, once they actually had to complete a series of tasks. Despite the first impression, the Helmet website could not efficiently support users. As a result, they made mistakes, and the website could not provide them with a useful feedback to correct their behavior. The important navigation tools are the search boxes (item search and web search), since, naturally, one of the basic user needs on the Library website is “to search”. The research revealed usability problems with these tools, and, in the author’s opinion, their current formulation should be revised.

Finally, the third research question asked for recommendations which might help to enhance the user experience on the Helmet website. Summarizing these recommendations here, it should be said that the E-library section and navigation inside this part of the

website work efficiently and do not require correction. However, the “Search Results” pages should provide the user with hints in the case the search has given no results. Navigation between Helmet (helmet.fi) and Catalogue (haku.helmet.fi) websites should be made more transparent. Moreover, the coexistence of two separate search tools should be developed. It is recommended to develop a mobile version of the Helmet website. The author would recommend to re-build the Helmet homepage basing on the users’ key interests and tasks. Currently, there exists a tangible information gap between the Helmet library network and the citizens; it is worth to explore this gap further and to find ways to overcome it.

The Helmet library network is a public system which inspires people, provides them with the vast set of services, creates an active environment with various opportunities for the customers. Therefore, paraphrasing Alan Dix (Dix 2004), it is significant for Helmet in the digital dimension to put the users first and keep them there during the entire process of media management, not only creating the intriguing and demanded content, not only providing the modern look of the resource, but also exploring the user, applying the findings and adjusting the content for the modern digital way of living.

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## APPENDICES

### Appendix A. The Pilot Survey Form (example of English version)

#### Opinions Survey

This survey is a part of an academic research for the Helsinki Metropolitan Area Libraries (city libraries) "Helmet".

The author: Varvara Shumova, Arcada university, Media Management Master Degree Program, Helsinki.

The survey is intended to give Helmet library a guidance to improve its web-site. The results will be published in a master thesis. You can check it in a year on the web-site

<http://www.theseus.fi> or contact the author [varvara.shumova@arcada.fi](mailto:varvara.shumova@arcada.fi).

The questionnaire contains **23 questions** about various Helmet's services.

The questions **from 1 to 10** are the main part **(A)**, and the questions **from 11 to 23** are optional **(B)**. If you feel very enthusiastic about the topic, please fill in the form from the beginning to the end. I appreciate your participation and contribution very much.

**This survey is to be done anonymously.**

**Thank you for your help! It is very important for the further development of the libraries.**

This survey is to be done anonymously. Thank you for your help! It is very important for the further development of the libraries.

#### **START**

**Please answer the questions about Helmet library's services as they relate to you.**

**Age group**  25 - 29  30 - 34  35 - 39  40 - 44  45 - 50

**Your gender**  female  male  other/don't want to state

**Mother tongue**  Finnish  Swedish  Somali  Arabic Other

#### **Your education**

Elementary school  High school  College

Undergraduate  Postgraduate some

#### **Level of digital competence**

Basic user  Independent user  Proficient user

**Do you have children?**  Yes  No

#### **What language version of Helmet web-site do you usually use?**

Finnish  Swedish  English  Russian  No one Other \_\_\_\_\_

## Opinions Survey. Part A

### Did you know before that...

**1. ... you can use multi-language library, i.e. to borrow books written in different languages?**

Yes

No

If yes, please rate how important it is for you.

Now that you have learnt about it, are you likely to use it in the future?

Not important

No

Quite important

Maybe from time to time

Very important

Yes

**2. ... you can borrow board games?**

Yes

No

If yes, please rate how important it is for you.

Now that you have learnt about it, are you likely to use it in the future?

Not important

No

Quite important

From time to time

Very important

Yes

**3. ... you can book and use a computer to work in the library?**

Yes

No

If yes, please rate how important it is for you.

Now that you have learnt about it, are you likely to use it in the future?

Not important

No

Quite important

From time to time

Very important

Yes

**4. ... you can use free e-courses (on-line courses): study music, Finnish, other languages?**

Yes

No

If yes, please rate how important it is for you.

Now that you have learnt about it, are you likely to use it in the future?

Not important

No

Quite important

From time to time

Very important

Yes

**5. ... you can read e-magazines and/ or e-books anywhere using Helmet account (Finnish, English, and other languages)?**

Yes  No

If yes, please rate how important it is for you. Now that you have learnt about it, are you likely to use it in the future?

Not important  No  
 Quite important  From time to time  
 Very important  Yes

**6. .. you can print (or 3D print), copy, scan and fax files in Helmet libraries?**

Yes  No

If yes, please rate how important it is for you. Now that you have learnt about it, are you likely to use it in the future?

Not important  No  
 Quite important  From time to time  
 Very important  Yes

**7. ... you can take part in various educational and entertainment events: language cafés, art and sport work-shops, handcraft classes, painting classes, dance classes?**

Yes  No

If yes, please rate how important it is for you. Now that you have learnt about it, are you likely to use it in the future?

Not important  No  
 Quite important  From time to time  
 Very important  Yes

**8. ... you can rehearse in music rooms in the library?**

Yes  No

If yes, please rate how important it is for you. Now that you have learnt about it, are you likely to use it in the future?

Not important  No  
 Quite important  From time to time  
 Very important  Yes

**9. ... using Helmet account you can listen free on-line music collections from Naxos Music Library?**

- Yes  No

If yes, please rate how important it is for you. Now that you have learnt about it, are you likely to use it in the future?

- Not important  No  
 Quite important  From time to time  
 Very important  Yes

**10. ... you can get an answer to absolutely any question, using library on-line service?**

- Yes  No

If yes, please rate how important it is for you. Now that you have learnt about it, are you likely to use it in the future?

- Not important  No  
 Quite important  From time to time  
 Very important  Yes

**Great job! Thank you!**

**If you feel very enthusiastic about the topic, please fill in the form to the end.**

**You will help me and the library a lot!**

**Opinions Survey. Part B**

**Did you know before that...**

**11. ... you can borrow books form other libraries in Finland, using Helmet account?**

- Yes  No

If yes, please rate how important it is for you. Now that you have learnt about it, are you likely to use it in the future?

- Not important  No  
 Quite important  From time to time  
 Very important  Yes

**12. ... you can borrow sport equipment: skates, skies, tennis racquet?**

- Yes  No

If yes, please rate how important it is for you. Now that you have learnt about it, are you likely to use it in the future?

- |                                          |                                            |
|------------------------------------------|--------------------------------------------|
| <input type="checkbox"/> Not important   | <input type="checkbox"/> No                |
| <input type="checkbox"/> Quite important | <input type="checkbox"/> From time to time |
| <input type="checkbox"/> Very important  | <input type="checkbox"/> Yes               |

**13. ... there are different convenient spaces for work in libraries that you can use free of charge (tables, armchairs, meeting points)**

- |                              |                             |
|------------------------------|-----------------------------|
| <input type="checkbox"/> Yes | <input type="checkbox"/> No |
|------------------------------|-----------------------------|

If yes, please rate how important it is for you.      Now that you have learnt about it, are you likely to use it in the future?

- |                                          |                                            |
|------------------------------------------|--------------------------------------------|
| <input type="checkbox"/> Not important   | <input type="checkbox"/> No                |
| <input type="checkbox"/> Quite important | <input type="checkbox"/> From time to time |
| <input type="checkbox"/> Very important  | <input type="checkbox"/> Yes               |

**14. ... you can record own music tracks in the library recording studios?**

- |                              |                             |
|------------------------------|-----------------------------|
| <input type="checkbox"/> Yes | <input type="checkbox"/> No |
|------------------------------|-----------------------------|

If yes, please rate how important it is for you.      Now that you have learnt about it, are you likely to use it in the future?

- |                                          |                                            |
|------------------------------------------|--------------------------------------------|
| <input type="checkbox"/> Not important   | <input type="checkbox"/> No                |
| <input type="checkbox"/> Quite important | <input type="checkbox"/> From time to time |
| <input type="checkbox"/> Very important  | <input type="checkbox"/> Yes               |

**15. ... you can free watch movies on InstantFlix anywhere, using Helmet account?**

- |                              |                             |
|------------------------------|-----------------------------|
| <input type="checkbox"/> Yes | <input type="checkbox"/> No |
|------------------------------|-----------------------------|

If yes, please rate how important it is for you.      Now that you have learnt about it, are you likely to use it in the future?

- |                                          |                                            |
|------------------------------------------|--------------------------------------------|
| <input type="checkbox"/> Not important   | <input type="checkbox"/> No                |
| <input type="checkbox"/> Quite important | <input type="checkbox"/> From time to time |
| <input type="checkbox"/> Very important  | <input type="checkbox"/> Yes               |

**16. ... you can download and use free Helmet application "Pocket Library" to borrow books, and renew your loans?**

- |                              |                             |
|------------------------------|-----------------------------|
| <input type="checkbox"/> Yes | <input type="checkbox"/> No |
|------------------------------|-----------------------------|

If yes, please rate how important it is for you.      Now that you have learnt about it, are you likely to use it in the future?

- |                                          |                                            |
|------------------------------------------|--------------------------------------------|
| <input type="checkbox"/> Not important   | <input type="checkbox"/> No                |
| <input type="checkbox"/> Quite important | <input type="checkbox"/> From time to time |
| <input type="checkbox"/> Very important  | <input type="checkbox"/> Yes               |

**17. .... you can use or borrow such things as: sewing machine, drill, hammer and other tools?**

- |                              |                             |
|------------------------------|-----------------------------|
| <input type="checkbox"/> Yes | <input type="checkbox"/> No |
|------------------------------|-----------------------------|

If yes, please rate how important it is for you.      Now that you have learnt about it, are you likely to use it in the future?

- |                                          |                                            |
|------------------------------------------|--------------------------------------------|
| <input type="checkbox"/> Not important   | <input type="checkbox"/> No                |
| <input type="checkbox"/> Quite important | <input type="checkbox"/> From time to time |
| <input type="checkbox"/> Very important  | <input type="checkbox"/> Yes               |

**18. ... you can perform at musical events in Helmet libraries?**

- |                              |                             |
|------------------------------|-----------------------------|
| <input type="checkbox"/> Yes | <input type="checkbox"/> No |
|------------------------------|-----------------------------|

If yes, please rate how important it is for you.      Now that you have learnt about it, are you likely to use it in the future?

- |                                          |                                            |
|------------------------------------------|--------------------------------------------|
| <input type="checkbox"/> Not important   | <input type="checkbox"/> No                |
| <input type="checkbox"/> Quite important | <input type="checkbox"/> From time to time |
| <input type="checkbox"/> Very important  | <input type="checkbox"/> Yes               |

**Did you know before that...**

**19. ... you can use various on-line databases: literature, music, general knowledge and dictionaries, film and art, articles?**

- |                              |                             |
|------------------------------|-----------------------------|
| <input type="checkbox"/> Yes | <input type="checkbox"/> No |
|------------------------------|-----------------------------|

If yes, please rate how important it is for you.      Now that you have learnt about it, are you likely to use it in the future?

- |                                          |                                            |
|------------------------------------------|--------------------------------------------|
| <input type="checkbox"/> Not important   | <input type="checkbox"/> No                |
| <input type="checkbox"/> Quite important | <input type="checkbox"/> From time to time |
| <input type="checkbox"/> Very important  | <input type="checkbox"/> Yes               |

**20. ... you can take part in "Fairy tales hours" in various languages with your child?**

- Yes  No

If yes, please rate how important it is for you. Now that you have learnt about it, are you likely to use it in the future?

- Not important  No  
 Quite important  From time to time  
 Very important  Yes

**21. ... you can borrow musical instruments: piano, kantele, guitar, drums, ukulele?**

- Yes  No

If yes, please rate how important it is for you. Now that you have learnt about it, are you likely to use it in the future?

- Not important  No  
 Quite important  From time to time  
 Very important  Yes

**22. ... there are various art work-shops and master-classes for children in Helmet libraries?**

- Yes  No

If yes, please rate how important it is for you. Now that you have learnt about it, are you likely to use it in the future?

- Not important  No  
 Quite important  From time to time  
 Very important  Yes

**23. If you would like to share any additional comments or suggestions about Helmet services, please enter them below.**

**Well done! Thank you very much for your participation and help!**

## Appendix B. Usability test consent form

**Please read and sign this form.**

**In this usability test:**

- You will be asked to perform certain tasks on a computer.
- As you do the tasks, your eye movements will be recorded and later analysed to understand how the system interacts with users and provide them with the necessary information.
- We will also conduct an interview with you regarding the tasks you performed.

Participation in this usability study is voluntary. All information will remain strictly confidential. The descriptions and findings may be used to help improve the Helmet website. However, at no time will your name or any other identification be used.

You can withdraw your consent to the experiment and stop participation at any time. If you have any questions after today, please contact Varvara Shumova, [varvara.shumova@arcada.fi](mailto:varvara.shumova@arcada.fi)

- I agree to participate in the academic study conducted and recorded by the student of Arcada university, Varvara Shumova (Media Management program).
- I understand and consent to the use of the recording by the researcher, Varvara Shumova. I understand that the information and recording is for research purposes only and that my name and voice will not be used for any other purpose.

Please sign below to indicate that you have read and you understand the information on this form.

Date: \_\_\_\_\_

Please write your name: \_\_\_\_\_

## Appendix C. Instructions for the usability test (Eng. version)

**Please read through these instructions carefully before starting:**

1. Please start each task from the main page <http://www.helmet.fi/fi-FI>
2. There is no right or wrong answer, and no right or wrong way of doing something.
3. If you have any questions, comments or areas of confusion before you start working, please let me know.

## Tasks

**N 1** You are living in Helsinki, and next week, your friends will visit from Japan. You'd like to tell them about the city history and some famous Finnish people. You decide that Tove Jansson and her books would be a good place to start. Please locate one book on the website.

**N 2** Your friend Alex has just moved to Itäkeskus. He is studying Finnish. Where can he meet new people and chat with them in Finnish? Please name the place, the address and the schedule.

**N3** You like to read books and magazines on your laptop or tablet. You want to know more about this service in Helmet library. Find the information guide on the website explaining what you should do to read books using your own device.

**N4** You enjoy reading books in German, French, Czech and Arabic. Which library houses a collection of books in foreign languages? Please find address of this library, its schedule and in how many languages there are books there.

**N5** You like to watch free on-line movies on your laptop or tablet. Find a collection of on-line movies on the Helmet website.

## Appendix D. Post-test interview

Respondent # \_\_\_\_\_

**Age group**  17-24     25 – 29     30 - 34     35 - 39     40 – 44     45-50

**Your gender**     female     male     other/don't want to state

**Mother tongue**  Finnish     Swedish     Somali     Arabic    Other \_\_\_\_\_

**Level of Finnish**  Basic     Intermediate     Advanced

**Your education**  Elementary school     High school     College  
 Undergraduate     Postgraduate some

**Level of digital competence**

Basic user     Independent user     Proficient user

Please give your feedback about Helmet website and your experience, rating the following statements.

**1. It's easy to find my way around the site.**

strongly agree      agree      neutrally      disagree      strongly disagree

○ ——— ○ ——— ○ ——— ○ ——— ○

**2. I can get to the required information quickly.**

strongly agree      agree      neutrally      disagree      strongly disagree

○ ——— ○ ——— ○ ——— ○ ——— ○

**3. I always felt I knew what was possible for me to do next.**

strongly agree      agree      neutrally      disagree      strongly disagree

○ ——— ○ ——— ○ ——— ○ ——— ○

**4. It was easy to find the prompts or links on the website.**

strongly agree      agree      neutrally      disagree      strongly disagree

○ ——— ○ ——— ○ ——— ○ ——— ○

**5. My mistakes were easy to correct.**

strongly agree      agree      neutrally      disagree      strongly disagree

○ ——— ○ ——— ○ ——— ○ ——— ○

**6. How confident do you feel doing these tasks?**

very confident      confident      neutrally      unconfident      absolutely unconfident

○ ——— ○ ——— ○ ——— ○ ——— ○

**Post-test open-ended questions for the interview**

1. What did you like about Helmet website?
2. What do you think is the biggest problem with the site?
3. What could be improved?
4. What is your overall impression of the website?