Suggesting suitable methodology for the evaluation of structural design of desktop version of websites

With focus on Navigation component in Information Architecture

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Abstract

In this thesis, I seek a better understanding how to approach website structure evaluation on desktop versions of websites and, in the same time, actively involve website stakeholders into a process of evaluation.

The aim of this thesis is to suggest a suitable methodology for evaluation of structural design of websites by non -experts. I built my thesis on a hypothesis that the evaluation method might be based on a toolkit, which should enable non-experts to actively engage in the evaluation process and obtain meaningful results from the evaluation.

Due to the objectives that I set in the study, its research questions and my vision of the problem, in the paper, I use the qualitative research methodology. I look into a relevant literature to explore what methodology might be suitable for evaluation of information architecture of websites by non-professionals. Then, I make generalization on available methods. Making generalizations, I explain why methods that I reviewed do not supports answering my questions, what is missing in them, what inspires me and how can I suggest going about the toolkit. Besides, due to explorative character of the thesis, I am using existing theories to understand the concept of information architecture, assess what features of information architecture components should be included in the evaluations, consider how information architecture specialists go about website evaluation, how do they evaluate website structures. Finally, based on existing theories, concepts and my generalizations, I come up with a set of heuristics that evaluates navigation as information architecture component.

In the study, I came to conclusions that in existing methodologies no one attempted to evaluate the web site architecture as a seamless whole construct. Moreover, surprisingly few website owners considered to evaluate the architecture of their website before making its' redesign. Literature review suggested that the closest match to methodology that I look for is heuristic evaluation. Therefore, to answer my problem statement, I have chosen to focus my efforts on making heuristics for the evaluation of website construct. To target non-professional evaluators, heuristics are made in form of cards that contain explanations, examples, leave place to comments.

In the thesis, I have set out a conceptual framework for one out of four IA components. However, to test website structure, the framework should be further expanded to evaluate all four IA components (Navigation, Labelling, Search and Organization). Furthermore, the future research should test the theoretical toolkit in context of IA projects.

Acknowledgements

List of symbols and abbreviations

IA   Information Architecture

IA specialist   specialist in Information Architecture

IE   information environment

UEM   usability evaluation method

HCI   human computer interactions

WSEM   website evaluation method

UCD   user-centered design

EM   evaluation method

1. Introduction

We live in the age of the "digital transition" and move towards a situation where the most significant pieces of information become available in digital form (Bawden, 2008). This trend began in the 1970s and was speeded up in 1990s by the rise of Internet and latterly by the advent of the social networking tools of Web 2.0. (Bawden, 2008). These technical advances led to a great amount of available information that can be accessed with a wide array of Internet enabled appliances.

This abundance of information not only makes our lives better and easier, but also introduces new challenges because "with so much information available in so many places, it can sometimes be difficult to cut through the noise to find the information you need and understand it once you have found it" (Rosenfeld et al., 2015 p.1). Thus, sometimes a need to evaluate information construct arises. This need may arise for both experts and non-professionals. There are tools for evaluating information constructs for experts e.g. card sorting or heuristic evaluation. However, it seems that there is no tool that enables non-experts to actively engage in the evaluation process; and, in the same time, obtain meaningful results from evaluation. Therefore, there should be a tool, which enables non-experts to evaluate digital information constructs and obtain meaningful results.

Hence, in this thesis I aim to find a way to involve non-experts in evaluation of quality of information architecture construct on a desktop version of websites. Moreover, the evaluation method should let evaluators obtain significant outcomes. Furthermore, I base my efforts upon a hypothesis that the evaluation method can be based on a toolkit that would support justification of Information Architecture design solutions.

To achieve this, the toolkit should rest on widely accepted Information Architecture's theoretical foundation. The toolkit should be applicable in the majority of Information Architecture cases. Besides, it should take account of modern trends in IA and should be able to evaluate all existing shared information constructs. Finally, the toolkit should leave sufficient room for interpretation in each individual case.

Why is it relevant?

User perspective

Due to a rapid digitalization, most companies try to reach their customers online. To do it, some companies use royalty-free and license-free online content management systems. Such as, WordPress, Moodle, Joomla, etc. Other companies hire professional web developers.

If getting online did not have a desired effect companies try to find out what went wrong (Benoit, 1997). Moreover, there is the so-called *corrective action* point in this situation, where the companies' executives make a plan how to solve or prevent the problem (Benoit, 1997). At this point, executives, in my view, decide whether they need an IA specialist, user experience designer or other web specialist to improve their website. Thus, **they face a need to access the existing website structure and evaluate it**. However, this task is rather challenging because some specialists suggest that good information architecture is invisible (Rosenfeld et al., 2015 p.26). Thus, Rosenfeld claims that "one of the challenges people have with information architecture is that they can't easily point to it" (Rosenfeld et al., 2015 p.26). Besides, he asserts that a good information architecture is "invisible to the eye" (Rosenfeld et al., 2015 p.26).

Information architect's perspective

Information architecture is a relatively new field of study that is still evolving.

Information architecture (IA) is a field of study that strives to optimize available digital information and to make it findable and understandable (Rosenfeld et al., 2015 p.1). Broadly speaking, information architecture discipline can be defined as a practice of designing structures for information environments (IE) that are optimized for findability and understandability.

The study field of information architecture has several recognized resources. Some sources guide information architects throughout the process of designing good structures (Rosenfeld et al., 2015). Whereas, other sources define concepts, offer models or provide theoretical background for the work that needs to be done to create a solid website structure (Bates, 1989; Bawden, 2008; Fogg, 2003; Hasle, 2011; Lykke, 2009; Oinas-Kukkonen & Harjumaa, 2008; Russell-Rose & Tate, 2013; D. Spencer, 2009; R. Spencer, 2000a; Spool et al, 2004). However, all these sources cover different aspects related to information architecture. For instance, Kalbach elaborates mainly on website navigation, Bates contributes on a search pattern, etc. Thus, information architects operate with knowledge from multiple theoretical sources.

These theoretical sources contain concepts that I, as information architect, keep coming back to. For instance, information ecology model by Morville and Rosenfeld; information scent by Spool; seeking behavior model by Bates, etc. To a certain degree, they are applicable to all IA related projects. These concepts I identified from a core IA related literature (Benoit, 1997; Fogg, 2003; Kalbach, 2007; Nielsen, 2000; Rosenfeld et al., 2015; Russell-Rose & Tate, 2013; D. Spencer, 2010; Spool et al., 2004). Hence, I can say that these concepts are elementary and grounding for specialists dealing with information architecture. However, mentioned theoretical concepts are numerous and often must be tailored to a specific case. Moreover, the field of information architecture is constantly evolving and theoretical principles are often challenged by tailoring IA design principles to a modern web development trends. For instance, applying IA architecture concepts to evaluation of single page website (Hansen & Sigvardt, 2015).

Therefore, as a specialist in information architecture, I miss an evaluation method that would be suitable for evaluation of IA constructs and, in the same time, would be appropriate for use by non-experts. Moreover, non-experts should be able to obtain reasonable results on a quality of IA in a website under review.

The method should be based on a toolkit that is tailored specifically to IA. The toolkit should be based on existing IA related concepts. However, the toolkit must be fairly general because it should be applicable for evaluation of most desktop versions of a website.

This evaluation method, on the one hand, must facilitate specialists in information architecture that would like to reduce internal pressure and convince stakeholders to make suggested changes into their shared information environment.

On the other hand, the evaluation method must facilitate people who are not involved into the field of information architecture but face the need to be able to access existing shared information environment. This need can arise if, for instance, a client needs to justify a presented design or if an owner of an existing information system wants to assess its design of information environment (IE) in context.

If used by information architecture specialists, the evaluation method, however, cannot replace research stage, stage of development of "high-level conceptual framework for structuring and organizing an information environment" (Rosenfeld et al., 2015 p.356) and a stage where IA specialist must design an architecture style guide document "that explains how the environment is organized, why it is organized that way, who it's for, and how the architecture should be extended as the system grows" (Rosenfeld et al., 2015 p.435). Instead, the evaluation method must facilitate people, to whom information architects address, presenting their findings and structures. These people typically are not involved into the field of information architecture but face the need to access and evaluate existing information environment. For instance, CEO (chief executive officer) of the company, manager or other internal stakeholders. Therefore, in the thesis information architecture specialists are my secondary target audience, whereas, people that need to justify IA are my primary target audience.

Personal perspective

During my practice in the field of information architecture, I noticed that my clients are not entirely satisfied, if I report that I base my solutions for their new website on a user research. Moreover, clients are not interested to hear what theories and concepts I used in my research and development stage.

Instead, clients often question my suggestions and prefer to see logic behind my solutions. This can be explained by another discipline that studies human behavior: "modern psychology tells us that as humans we are only moderately good at deductive logic, and we make only moderate use of it. But we are superb at seeing or recognizing or matching patterns-behaviors that confer obvious evolutionary benefits" (Arthur, 1994, p. 406). In other words, to convince my client that offered IA is good, I often need to project cause-and-effect relationship of my decisions.

Furthermore, in my thesis, I choose to focus primarily on desktop version of websites because, in my view, following modern trends web designers and developers forget about basic concepts that make desktop websites user-friendly and usable.

For example, B&O BeoPlay A6 website (AAU, 2016b) and Georg Jensen The Gift Of Giving website (Awwwards, 2015). Both websites are highly rated in web design and development community (Awwwards, 2015). Both websites are stylish and modern. However, I think that the websites' structures are rather poor because, firstly, I do not see all categories, I do not have an information scent on these websites; secondly, some elements like music or an introductory movie are uncontrollable, the user cannot skip the movie if it started playing. Thirdly, I do not know what to expect, where I am going and how to get back to the main page. Furthermore, I do not know how long I need to scroll to reach the end of the site. The purpose of the sites are not clear. Rosenfeld et al. support, "because of the importance of navigation

to the user's experience of interacting with information environments, designers must be judicious when experimenting with new and untested navigation schemes (Rosenfeld et al., 2015, p. 179). Mentioned issues are only few critiques of the websites. These two websites, in my opinion, are good examples that the owners of the site must have a tool to evaluate the ready-to-launch product against some predefined statements. In this thesis, therefore, I aim to offer constitutes for a suitable for this purpose methodology.
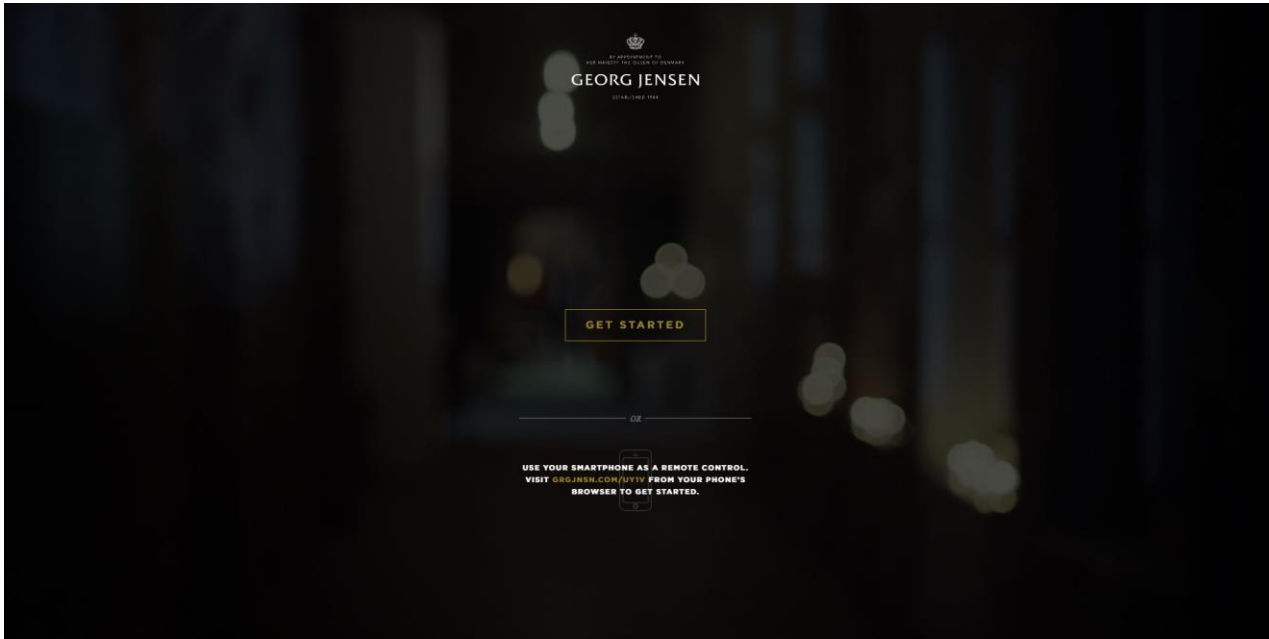
(Awwwards, 2015)
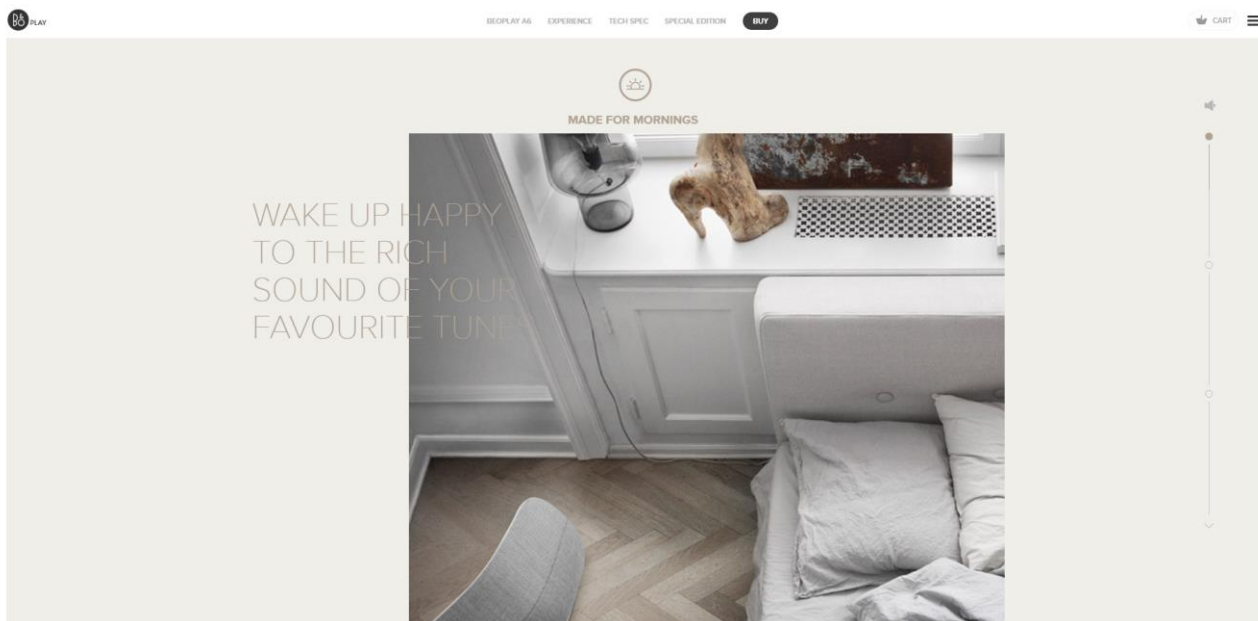
(Awwwards, 2015)

Summing up

Summing it up, the problem that I try to solve in this thesis is relevant both for users and for information architects. Besides, it is motivating for me as a future information architect.

In this thesis, I seek to come up with an evaluation method that will be suitable for evaluation of IA constructs on desktop version of websites and, in the same time, will be appropriate for use by non-experts. The method should be self-evident and easy to understand and interpret. Moreover, applying this method, non-experts should be able to obtain reasonable results on a quality of IA in a website under review.

Problem statement

In this chapter, first of all, I present the research question. Subsequently, it will be explained further and possible sub-questions will be presented. Then I introduce my hypothesis on what the toolkit should be based upon. Moreover, I present a target audience for the toolkit and state assumptions that I have, writing the thesis.

The objective of this thesis is to establish methodology for evaluation of structural design of desktop version of websites and suggest what a toolkit in such methodology should constitute.

Research question

Therefore, the underlying research question in this thesis is:

What constitutes a suitable methodology for the evaluation of structural design of websites that is based on a toolkit, which enables non-experts to actively engage in the evaluation process and obtain meaningful results from evaluation?

To narrow my problem statement, in the thesis, I answer the following sub-questions:

- **How can I evaluate IA with focus only on the evaluation of navigation and labeling IA components?**
- **How can I review existing website usability evaluation methods?**
- **Can I find an appropriate website usability evaluation method that would be suitable for engaging non-experts into the evaluation of IA components on a desktop version of websites?**
- **Can I establish general heuristics for the evaluation of navigation component of IA?**

To narrow the scope of the toolkit that I will formulate I have a hypothesis that the toolkit that I try to formulate should:

- **be based on widely accepted Information Architecture's theoretical foundation**
- **leave a sufficient room for interpretation in each individual case**
- **apply in the majority of Information Architecture cases**
- **be used to justify Information Architecture design solutions**
- **take account of modern trends in websites**
- **be able to evaluate all existing shared information constructs**
- **be self-evident, require no prior knowledge, review IA visible components**

On the one hand, the aim of the method is to evolve in evaluation people who are not involved into the field of information architecture but still need to be able to evaluate existing shared information environment. This need can arise in two cases: either when a client needs to justify a presented design or when the client wants to assess design of information environment in context.

On the other hand, these heuristics can be used by information architecture professionals as a tool that on late project stages should help their clients to justify suggested information architecture design.

As mentioned earlier, my practice shows, that suggested by information architect changes to existing information architecture often face resistance to change within the company, even though information architect's decisions are based on existing user research, valid requirements and iterations. Thus, these heuristics can be used to reduce internal pressure and convince stakeholders to make changes in the system.

Target audience

Thus, suggested toolkit has both primary and secondary target audience:

Its primary target audience is people who are not involved in the field of information architecture but still need to be able to evaluate existing shared information environment.

Its secondary target audience are specialists in information architecture that would like to reduce internal pressure and convince stakeholders to make suggested changes into their shared information environment.

To meet my target audience's needs I aim to create a toolkit that, firstly, does not require prior knowledge within the field and experience in evaluating IA structures; secondly, evaluates existing information environment by reviewing its visible components. Thirdly, the toolkit must be self-explanatory.

Assumptions

To formulate these heuristics I assume that every website has an information architecture that can be described using four IA components (Navigation, Labeling, Search and Organization component). Therefore, it is reasonable to make heuristics that help to evaluate each of these components.

Structure of the thesis

The rest of the thesis is organized in the following way:

- Chapter 2

This section introduces and discusses the methodology and method applied in the thesis.

- Chapter 3

This section introduces and discusses the website usability evaluation methods and suggests what evaluation method should be chosen to answer my problem statement.

- Chapter 4

This section reviews relevant existing literature in order to build a theoretical basis for answering the research question.

- Chapter 5

This section provides a theoretical foundation for Navigation as IA component on the website, describes Navigation IA component and suggests heuristics that evaluate each navigation component on websites.

- Chapter 6

This section provides conclusions to a thesis, contains reflections on a suggested methodology, offers a toolkit design and content. Moreover, the chapter and discusses the prospective future work in the area of IA evaluation.

- Chapter 7

The last chapter contains bibliography of all used literature and web sources.

2. Methodology

This section of my thesis accounts for the choice of approach, research design and those methods this thesis adopts and applies.

The objective of this methodological section is to identify the *recipe* or set of *guidelines* to be used in the unfolding and presentation of this thesis. Yet, the main emphasis throughout this section will be to discuss the implications behind my methodological choices and considerations.

In short, in this methodological section:

- I make a brief summary based on Introduction chapter where I mention *what* I am attempting, and *why* I am doing it

- I clarify *how* I am going to do it.
  - firstly, I briefly define research methodology;
  - secondly, I discuss qualitative and quantitative research methods;
  - thirdly, I explain the issue of verification of qualitative methodology;
  - finally, I elaborate on a future work to achieve solid results.

What I am attempting?

In this thesis, I attempt to suggest a suitable methodology for the evaluation of structural design of desktop version of websites that can be used by non-experts.

I base my efforts in this thesis on a hypothesis that such evaluation might be based on a toolkit, which enables non-experts to actively engage in the evaluation process and obtain meaningful results from evaluation. Moreover, I assume that website structure might be evaluated using four information architecture components (Navigation, Labelling, Search and Organization). Finally, due to time and space limitation, in this thesis, I focus only on Navigation IA component. However, in real life, to make a solid website structure evaluation, all four components should be taken into consideration.

Why I am doing it

As mentioned in the introduction, evaluation of website structure is relevant both for IA specialists and for non-experts. Among other reasons, it happens because non-experts face a need to be able to access existing website structure and evaluate it. IA specialists also lack a method that is suitable for the evaluation of IA constructs that could facilitate specialists in information architecture with a tool that would reduce internal pressure and convince stakeholders to make suggested changes into their shared information environment.

Choosing a research methodology

Leedy and Ormrod define a research methodology as the general approach the researcher takes in carrying out the research project (Leedy & Ormrod, 2005, p. 12).

In social science study field, research methods are often divided into two main types: qualitative and quantitative (Alasuutari et al, 2008), and more recently a third paradigm emerged, known as the mixed methods research (Creswell, 2003).

It seems that in social science the discussion whether qualitative of quantitative methods are more valid is endless. Therefore, in the thesis, I briefly discuss the characteristics of both methodologies.

Discussing qualitative and quantitative research

Quantitative research is "explaining phenomena by collecting numerical data that are analyzed using mathematically based methods (in particular statistics)" (Aliaga & Gunderson, 2002). In other words, qualitative methods seek to measure social phenomena collecting numerical data such as statistics, numbers, and other mathematically based data. These types of data are usually applied for larger samples, to make measurements more precise and representative, to test hypothesis, to increase reliability of the data and observations (Silverman, 2006). Moreover, the quantitative methods are used to facilitate the finding of generalizable data (Patton, 2002). This characteristic of this methods lies in the assumption that social phenomena can be expressed numerically and subsequently be quantified and analyzed (Muijs, 2004).

Using **quantitative research** methodology, researchers primarily employ investigation techniques such as surveys research, correlational research, experimental research, causal comparative research. Besides, employing quantitative research methodology, researchers collect data using predefined measurement instruments that provide statistical data (Creswell, 2003). Thus, the quantitative approach aims to explain social phenomena by investigating what are the factors that drive to a certain conclusion. Hence, this methodology is appropriate to test specifically defined hypotheses to uncover and explain causal relationships and dependencies between social phenomena (Gilbert, 2008).

However, the quantitative approach has its weaknesses. Opponents of this research method frequently argue that studies in this school of research are inclined to have little or no contact with the people (Silverman, 2006). The variables in the study may be defined in a random way (Silverman, 2006). Furthermore, the social reality is too complex and comprehensive to be simplified and compressed in several hypotheses (Gilbert, 2008). Consequently, the perspective of researchers that use quantitative approach is constrained, and, therefore, it is essentially important to have extensive knowledge on the area under investigation in order to develop accurate and correct research questions (Gilbert, 2008).

Moreover, some social processes or phenomena are simply not measurable by numbers, e.g. through statistics or with random samples (Silverman, 2006). Thus, if researchers choose to use quantitative methods in such studies, it might limit the chances of discovering certain aspects of these phenomena (Silverman, 2006).

Alternatively, researchers might use a **qualitative approach**. Qualitative research can be defined as "*any kind of research that produces findings not arrived by means of statistical procedures or other means of quantification*" (Strauss & Corbin, 1991, p. 17). In other words, the focus in such research lies on in-depth understanding of arguments, opinions and experiences rather than on numbers.

In qualitative approach the investigator primarily employs constructivist perspectives for developing knowledge, such as the focus on the multifaceted nature of the individual experience, shaped by social, cultural and historical factors (Creswell, 2003). The investigation techniques in qualitative method include narratives, ethnographies, participant observations, case studies or grounded theory studies.

The data collection method is mainly open-ended. Results are often expressed in a textual or graphic form. Out of these results, researchers develop generic ideas and patterns.

Qualitative approach aims to understand the phenomena by exploring the problem in hand. Therefore, this method is the most suitable for investigation of newly emerging trends and topics, where little research has been undertaken and existing theories are inapplicable (Morse, 1991). Thus, the qualitative research methods might be accused of being rather subjective, due to the personal involvement of the researcher in a rather open study.

Furthermore, opponents of this method argue that due to its exploratory and open nature, it lacks scientific rigidity. For instance, employing this methodology, the researcher makes subjective judgments at interpreting his findings, which, in turn, might lead to biased or incomplete results (Sechrest & Sidani, 1995).

Additionally, qualitative research is mostly inductive. Therefore, opponents of this research methods argue that, even though backed up with a theoretical framework, the data should be guiding the study, not a theory (Taylor & Bogdan, 1998)

Besides, the criticism of qualitative research methods are often based on the aspects of validity and reliability. These issues are, therefore, discussed deeper later in the thesis.

Another drawback of qualitative research methods is that the generalization level in this method is high. Thus, adopting this methodology, researchers might simply look at individual cases and make conclusions that oversimplify reality.

Moreover, qualitative research methods tend to be more expensive and time consuming because of the time it takes to read, categorize, and code transcripts that result from interviews, observations, and open-ended questions (Coghlan & Brannick, 2014; Russ-Eft & Preskill, 2009).

In addition, qualitative researchers suffer from the limited sample sizes and this may compromise the generalizability of the data beyond the sample selected for a particular study (Boyce & Neale, 2006). Yet, in some cases, qualitative research presents the preliminary steps to further investigation.

Although qualitative and quantitative research methods are different in their knowledge claims, strategies, data collected, they are not completely contradictory and incompatible (Alasuutari, 2009; Muijs, 2004). Moreover, their distinctive advantages could complement each other. This led to emergence of the third paradigm, the mixed method approach. Majority of researchers uses mixed research method.

The majority of researchers, "take a pragmatist approach to research, using different methods depending on the research question they are trying to answer"(Muijs, 2011, p. 6). In other words, in some cases researchers use qualitative methods, in other cases they will employ quantitative methods. However, "sometimes a mixed methods approach combining quantitative and qualitative methods will be the most appropriate" (Muijs, 2011, p. 6).

Hence, employing mixed methods allows the investigator to use the best features of both qualitative and quantitative approaches. Muijs supports, "mixed methods research is a flexible approach where the research design is determined by what we want to find out rather than by any predetermined epistemological position. In mixed methods research, qualitative or quantitative components can predominate or both can have equal status" (Muijs, 2004, p. 9). Mixed method is the most suitable when a research problem must be addressed both from a personal perspective and at a more generalized population scope (Creswell, 2003).

This approach is the most criticized on incompatibility issue, i.e. combining qualitative and quantitative research methods is still questionable by many researchers because two approaches are based on fundamentally different and opposing foundations (Smith & Heshusius, 1986). The incompatibility issue, in turn, questions the validity of the findings stemming from studies that rely on mixed method approach.

Research methodology choice for the thesis

The choice of research methodology used in the thesis depends mainly on the nature of the stated research question. For rather explorative studies, like this thesis, qualitative methods seem to be a suitable choice (Strauss & Corbin, 1990).

The purpose of qualitative research studies is to pursue a better understanding of complex situations. Thus, the studies based solely on qualitative research often have an exploratory nature. The purpose of this thesis is to **suggest a suitable methodology for evaluation of structural design of websites.** Moreover, I base this thesis on a hypothesis that the methodology for IA evaluation might be **based on a toolkit,** which should **enable non-experts to actively engage in the evaluation process and obtain meaningful results from the evaluation.** In other words, in this thesis I seek a better understanding how to approach IA evaluation and how to actively involve website stakeholders into a process of evaluation.

Instead of measuring the phenomenon under review by numbers, in this thesis I look into a relevant literature to explore what methodology might be suitable for evaluation of IA of websites by non-professionals. Besides, due to explorative character of the thesis, I am using existing theories to understand the concept of IA. Moreover, I assess what features of IA components should be included in the evaluations, how IA specialists go about this problem, etc. Thus, I use open-ended research questions to explore expert's perspectives with focus on IA. Finally, based on existing theories and concepts, I come up with a set of heuristics that evaluates navigation IA component.

Thus, qualitative methodology is appropriate for this thesis because it is "typically used to answer questions about the complex nature of phenomena, often with the purpose of describing and understanding the phenomena from the participants' point of view" (Leedy & Ormrod, 2005, p. 94). In this thesis, I explore a complex field of IA and try to suggest a suitable methodology for the evaluation of IA components on websites. I explore the current evaluation methods that are used to evaluate IA on websites. It seems that IA evaluation is primarily based on website usability evaluations. The exploration of methods is accomplished through a review of all methods that are used to evaluate usability on websites. Moreover, in the thesis, I explore relevant IA concepts that could be included into IA heuristics. As mentioned earlier, I seek to make heuristics, which are focused on desktop versions of websites. Thus, the thesis has an exploratory nature because in my problem statement I have identified an area where, it seems, I acknowledged a gap and, by answering my problem statement can contribute to the field of IA.

To further reflect on my method, I find that it is relevant to refer to Sanders' Design landscape.
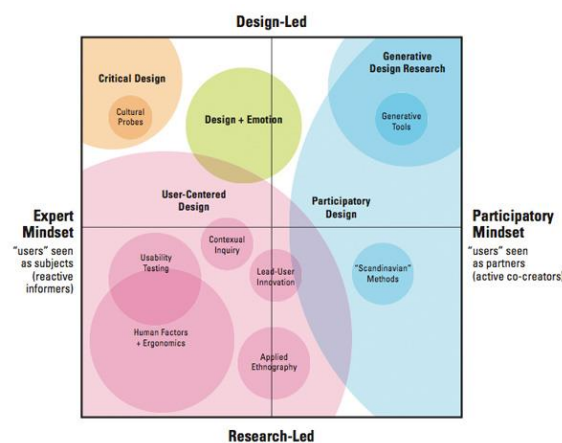
Figure 2-1 Sanders' Design Landscape (L. Sanders, 2008).

The design landscape is based on a Sanders' idea that there is an overall shift from the practice of design spanning from being expert driven to a participatory mindset. The general idea behind the model is that users of the system may contribute to a design process if they receive appropriate tools to express themselves (L. Sanders, 2008). Consequently, it seems that I am trying to make website evaluation less expert minded and

less research-oriented. Instead, I try to make evaluation process more design oriented and make evaluation process more participatory. Therefore, qualitative approach was chosen for this thesis because in the thesis I attempt to make sense of IA specialists' experience, perception, beliefs, attitudes and behavior in a given context and suggest a toolkit for evaluation of IA in existing IE (Clissett, 2008) and apply it to an evaluation methodology.

This method is appropriate in the thesis because the thesis is rather empirical and interpretative because it involves examination of a particular literature from which general heuristics are drawn, while relying on my personal experience. Lindlof and Taylor support, the qualitative research methods are sensitive to social construction of meaning and rely on the interpretation and analysis of what people do and say, without making heavy use of measurement or numerical analysis (Lindlof & Taylor, 2011).

Furthermore, qualitative researchers have a great advantage over quantitative researchers because new heuristics may be added while I gather data, and this can even occur in the later stages of the project. Thus, the flexibility of qualitative research permits me to follow leads that emerge (Charmaz, 2006, p. 14). Moreover, according to Silverman, exploratory studies need to be less structured than confirmatory studies (Silverman, 2000).

The focus of the research, however, is inductive because I am trying to develop a toolkit that would promote understanding of how to actively engage non-experts into an evaluation process and obtain meaningful results from evaluation. It is inductive because I include relevant aspects for evaluation based on my own experience and exploring the relevant literature.

Despite the fact that qualitative approach is suitable for the thesis, the outcomes of the thesis are quite cumbersome. Yet, I do realize that I use qualitative research because I aim to present preliminary steps for further investigation. Therefore, after putting all heuristics on paper I must devote time and energy to carry out field observations and record findings afterwards.

Additionally, I do realize that some results from my experience and suggestions from literature are foreseeable for the researchers, therefore, to strengthen my thesis it is recommended to test heuristics in upcoming IA projects. This would insure that I would not miss out important issues related to evaluation criteria, methodology.

To sum up, based on the previous theoretical implications and the objectives of the thesis, I have chosen the qualitative approach to explain the research problem and to suggest a solution. Since, the objective of this study is to explore the problem; a qualitative approach seems to be the best-suited research methodology.

Verification of qualitative methods

Regardless of the choice of methodology, it seems that it is often recommendable to consider the concepts of reliability and validity. Therefore, due to the methodology chosen for this thesis, it is relevant to mention issues concerning qualitative research.

On the one hand, Patton suggests that validity and reliability are two aspects that any qualitative researcher should be concerned about while designing a study, evaluating results and judging the quality of the study (Paton, 2008).

On the other hand, some researchers suggest that the concept of reliability and validity is irrelevant in a qualitative research due to different purposes in evaluation. Thus, according to Stenbacka, "the concept of reliability is even misleading in qualitative research. If a qualitative study is discussed with reliability as a criterion, the consequence is rather that the study is no good" (Stenbacka, 2001, p. 552). As to the concept

of validity Stenbacka argues that the concept should be redefined for qualitative researches. Hence, Stenbacka describes the notion of reliability as one of the quality concepts in qualitative research which is"to be solved in order to claim a study as part of proper research" (Stenbacka, 2001, p. 551).

Reliability

Reliability brings up the question of whether a repetition of the same research by different investigators or by the same investigator at another time and place would come to the same result (Silverman, 2006). Thus, reliability is especially challenging to achieve in qualitative studies. Taylor and Bogdan support „*it is not possible to achieve perfect reliability if we are to produce valid studies of the real world*" (Taylor & Bogdan, 1998, p. 9). Additionally, Taylor and Bogdan say, qualitative studies emphasize validity and they "*are designed to ensure a close fit between the data and what people actually say and do*" (Taylor & Bogdan, 1998, p. 9).

However, this does not mean that qualitative researchers omit reliability. Silverman suggests possible measures that help conducting a reliable qualitative research study. Moreover, to make the outcomes of the thesis more reliable, these measures are followed in this thesis. Accordingly, Silverman suggests that researchers should make their research process and the choice of theory transparent (Silverman, 2006). The steps in such research process should be easy to follow, easy to understand and should be able to be reproduced by others. Furthermore, Silverman claims that readers of a research report should be able to access the concrete observations made during the project. Furthermore, Silverman believes that presenting the readers with only summaries or generalizations is not sufficient.

Following Silverman, I explain my choice of literature in this thesis. Moreover, I use direct quotes from the text to make my research process transparent. If I make examples in my explanations, I make screenshots and create figures to make my explanations clear, easy to follow and replicate.

Validity

Another important concept in verification of qualitative research methodology in social science is validity. The question of validity accesses whether a study accurately measured what it intended to measure (Silverman, 2006). In qualitative studies, especially in researches that employ exploratory methods, the answer to this question is less straightforward than in quantitative researches.

Thus, validity is an important aspect to effective research. It is concerned with the integrity of the conclusions that are generated from a piece of research (Bryman, 2012). Besides, it is a demonstration that a particular instrument in fact measures what it is intended to measure (Leedy & Ormrod, 2005; Postlethwaite, 2005).

Henceforth, for the validity of a qualitative study it is crucial that the interpretations made fit the theories that are developed out of them (Bryman, 2012). Thus, Pole and Lampard agree with Dey that to understand validity in the study one should look at whether a study is "*well grounded conceptually and empirically*" (Pole & Lampard, 2002, p. 208). In other words, it means that the quality of the process through which a study was designed and conducted influences the validity of the research. To make the qualitative study valid, examples supporting the meaning of the data should be given. Therefore, in the thesis I often use supporting examples. Moreover, as in the case of reliability, the context out of which the data was conducted must be taken into consideration (Pole & Lampard, 2002). In other words, during writing I always keep in mind the purpose of the research and my target audience. Furthermore, in qualitative research, validity can be addressed through the honesty, depth, richness and scope of the data achieved, the participants approached, the extent of triangulation and the disinterestedness or objectivity of the researchers (Cohen et al., 2007).

Future work

As mentioned earlier, the study has exploratory nature. I explore a complex field of IA and seek suggesting a methodology for the evaluation of website constructs by non-specialists. To strengthen the outcomes of my thesis, it would be a good idea to test the toolkit on both IA specialists and people who are going to use them. Johnson supports, in any qualitative research, the aim is to "engage in research that probes for deeper understanding rather than examining surface features" (Johnson, 1995, p. 4). To do it, though, a real life IA cases and website owners should be involved in a research. Such research requires testing a set on at least several cases, involving as much participants as possible. Thus, testing the toolkit, unfortunately, requires more time than I have for the thesis. However, I do realize that testing the toolkit is crucial before introducing it to other IA specialists because testing proves the validity and reliability of the method, measures usefulness of the method.

Thus, to strengthen my thesis, I might adopt a constructivist paradigm. The paradigm views knowledge as a social construct that might change depending on circumstances. Crotty defined constructivism as "the view that all knowledge, and therefore all meaningful reality as such, is contingent upon human practices, being constructed in and out of interaction between human beings and their world, and developed and transmitted within an essentially social context" (Crotty, 1998, p. 42). Moreover, the notion that supports constructivism is that reality is changing whether the observer wishes it or not (Hipps, 1993).

Thus, I think that constructivism may facilitate toward improving validity and reliability of the thesis because constructivism values multiple realities that different people have in their minds. Therefore, by testing the toolkit I might get different interpretations of reality. For instance, participants may view the toolkit from different perspectives. Besides, I might get diverse feedback on toolkit's improvement, etc.

By doing this, I allow participants in my evaluation to contribute to answering the research question. Besides, I will incorporate additional data collection methods into the thesis. For instance, involving participants and evaluators into the problem solving, I might use such data collection methods as observation, interviews and recordings which will lead to more valid, reliable and diverse construction of realities in the thesis.

Furthermore, to improve the analysis in the thesis and expand on understanding of the toolkit of other people I might involve several more investigators to use the toolkit on different IA projects at different time and location. Johnson supports a qualitative researcher can "use investigator triangulation and consider the ideas and explanations generated by additional researchers studying the research participants" (Johnson, 1997, p. 284).

Summary

To sum up, to answer my problem statement, in the thesis I have chosen to use the qualitative research methodology because the thesis is rather explorative due to the objectives that I set in the study, its research questions and my vision of the problem.

Further, in the thesis, using this approach, firstly, I look into a relevant literature to explore what methodology might be suitable for evaluation of IA of websites by non-professionals. Secondly, I use existing IA relevant theories to understand the concept of IA, assess what features of IA components should be included in the evaluations. I also try to discover how other IA specialists go about this problem, etc. Thirdly, I try to use existing theories to understand what IA are grounding for evaluation of IA components on websites. Fourthly, based on existing theories and concepts, I come up with a set of rules that evaluates navigation IA components. Finally, I suggest what might constitute a toolkit for evaluating of Navigation IA component and suggest future researches to the conceptual framework.

3. Website usability evaluation methods (UEMs)

In this chapter, I explain why website usability methods are relevant for evaluation of IA and what do I expect to achieve making UEM overview. Then, I give an overview of usability evaluation methods that are traditionally used to evaluate usability on websites. Furthermore, I elaborate on their strengths and weaknesses, mention in which product development stage they are traditionally applied. Moreover, in this chapter I make generalizations about the available methodology and, finally, I formulate requirements for a website structure evaluation method.

Why UEMs are relevant for evaluating website IA?

During the development process IA specialists use various research methods that include stakeholder interviews, heuristic evaluations, user testing, and card sorting (Rosenfeld et al., 2015). The research stage "provides a contextual understanding that forms the foundation for development of an information architecture strategy" (Rosenfeld et al., 2015, p. 314).

In the polar bear book, Rosenfeld et al. suggest using conceptual framework **Content/Context/Users** as a basis for balanced IA related research (Rosenfeld et al., 2015, p. 353). Thus, researching **Users** Rosenfeld et al. suggest using such methods as *usage analysis, search log analysis, surveys, contextual inquiries, focus groups, interviews*; researching **Content** Rosenfeld et al. recommend using *heuristic evaluation, content analysis, content mapping, benchmarking*; and, finally, researching **Context** authors advocate using *contextual inquiry, observation, focus groups* research methods. However, Rosenfeld admits, that, firstly, "it won't make sense or be possible to use every tool on every project" (Rosenfeld et al., 2015, p. 316). And, secondly, IA specialists "should absolutely seek out and try methods we haven't covered" (Rosenfeld et al., 2015, p. 316). Therefore, the methodology used in the IA study field is not bound by a definite research methodology. I must admit, that these evaluation methods are used in the research stage of the project.

The methods that are mentioned by Rosenfeld et al. belong to website evaluation methods. Sometimes, these methods are also labeled as WSEMs (Web Site Evaluation Methods). In this thesis, I focus on human based evaluation methods that are often applied to evaluate websites' usability. Thus, Fernandez et al. support "usability evaluation methods (UEMs) have been employed to evaluate Web applications" (Fernandez et al, 2011, p. 789). Moreover, usability is considered to be one of the most important quality factors in the evaluation of Web applications, along with others such as reliability and security (Fernandez et al., 2011; Offutt, 2002). IA, though, strives to make website structure usable, practical, and functional. Therefore, I think that website evaluation methods can also be used to evaluate website structure. Some website evaluation methods are appropriate to use in the post-production stage, e.g. user testing, heuristic evaluation, walkthroughs, etc. However, it seems that surprisingly few experts consider evaluating solely website structure. The structure, however, is simply visualized and explained to stakeholders. Thus, Rosenfeld et al. suggest explaining structure constructs in post-production stage using sitemaps, wireframes, prototypes and other content models (Rosenfeld et al., 2015). These methods, in my view, are used to visualize abstract, conceptual IA construct, but they do not allow evaluating it. Therefore, the contribution of IA specialist in the project remain invisible and is often underestimated (Rosenfeld et al., 2015).

What I aim for making an UEM overview?

Making an overview of existing usability methods, I hope to find an evaluation method that is suitable for evaluation of structural design of desktop version of websites in a final stage of development. If I would not find an evaluation methodology that could entail my requirements, I seek to be inspired to suggest a suitable methodology for evaluating websites with focus on of IA constructs.

As mentioned in introduction, the evaluation method that I aim to find should **be able to be conducted by non-professionals and be applied on a final stage of the web development project**. Furthermore, **non-experts should be able to obtain meaningful results from evaluation**. Moreover, looking into the most widely used evaluation methods, I need to make sure that **the method asks the right questions for evaluation of structural design of a ready to use product.** Besides, a method that evaluates IA **should be based on a conceptual framework that evaluates IA** (Rosenfeld et al., 2015, p. 323). For instance, Rosenfeld et al. suggest using Content/Context/Users model as a conceptual framework for conducting a research in IA. However, Rosenfeld et al. suggest using all these methods in development stage. For this thesis, I suggest using four IA components as a framework for evaluating IA (see Assumptions).

Based on these requirements, I think that the methodology for a website structure evaluation that I look for should be oriented on an evaluation of design with people, viewing people as co-creators in the design process. Moreover, the methodology should have a design-oriented perspective where end-users should contribute to a design process. Finally, based on my problem statement, the methodology should benefit from evaluators in the late stage in design.

To explain my idea, I use Map of design research introduced by Sanders (see Figure 3-1) (Sanders, 2008).

On this map she positions researchers into 4 dimensions: design led with expert mindset, design-led with participatory mindset, research-led with expert mindset, research-led with participatory mindset (see Figure 3-1) (Sanders, 2008).
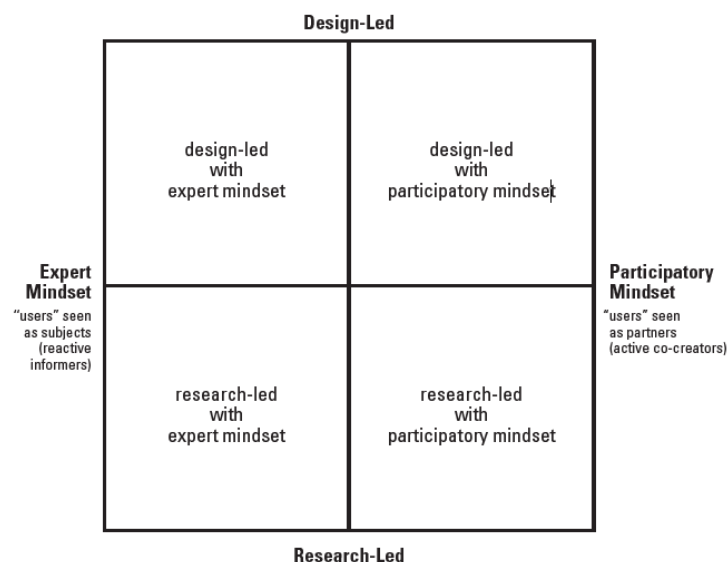
Methodologies that contain similar, in my opinion, features, Sanders labels as methodologies with **design led with a participatory-mindset**. Methodologies of this kind are placed in top-right side of the figure (see Figure 3-2). Sanders explains that in such methodologies design researchers "see the people [evaluators] as the true experts in domains of experience such as living, learning, working, etc. Design researchers who have a participatory mind-set value people as co-creators in the design process" (Sanders, 2008, p. 15).

Figure 3-1 Map of design Research-Underlying Dimensions (Sanders, 2008).
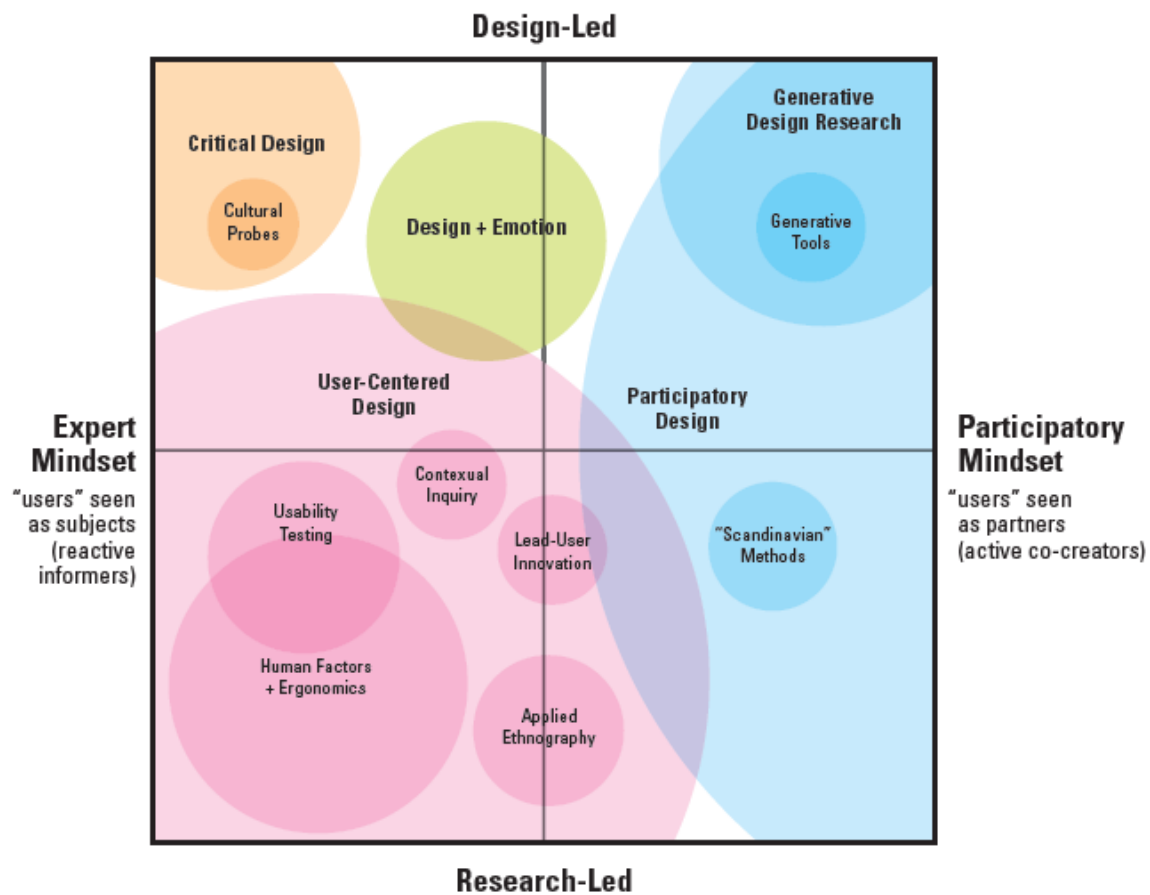
Figure 3-2 Map of design research - Research types

Furthermore, if I should locate the methodology I look for somewhere on the figure, I would place it in the top right corner, namely in the "generative design research" bubble (see Figure 3-2). I think so because, according to Sanders, this bubble "is design-led and fueled by a participatory mind-set" (L. Sanders, 2008, p. 15). In other words, the methodology that is described by this bubble should encourage people to generate and promote alternatives to the existing webpage design. To specify the position more precisely, I think that I can locate the methodology that I look for into a "Generative tools" bubble that is located in the generative design research bubble because, according to my hypothesis, such methodology should be based on a toolkit (see Figure 3-2). Sanders explains that "generative tools" "refers to the creation of a shared design language that designers/researchers and the stakeholders use to communicate visually and directly with each other" (L. Sanders, 2008, p. 15). In other words, the methodology should support people to express "infinite number of ideas" through a toolkit offered by the methodology (L. Sanders, 2008, p. 15). Moreover, the methodology should provide evaluators with an insight how to represent the site structure, their company, business goals, and website objectives to their customers. Furthermore, information architects could be filled with ideas and insights of what the people who will be represented through the web design think about different aspects of the site, where they hesitate, why, what can be adjusted or improved, etc.

To sum up, based on Sanders' mapping of design research methodologies, reviewing UEMs I will look for a methodology that is based on principles of participatory design and characterized as design-led driven with participatory mindset and based on generative tools. In other words, the methodology that I look for should encourage people to evaluate existing website structures by using an artifact that promotes critical thinking.

Website usability evaluation methods

There are various website evaluation methods. Usability evaluation methods are a set of methods that are used to evaluate human interaction with a product (Gray & Salzman, 1998, p. 206). These methods are aimed at identifying issues or areas of improvements in human computer interaction in order to increase usability of a product (Gray & Salzman, 1998). Typically they "come into play sometime after needs assessment and before beta-testing" (Gray & Salzman, 1998, p. 206).

The choice of appropriate evaluation method depends on many factors: the purpose of evaluation, product development stage, the type of information environment, time and resources constrains, etc. Each method has its strengths and weaknesses.

In the process of analyzing websites, Stolz et al. suggest that website evaluation methods (WSEMs) can be categorized into user-based usability evaluation methods, evaluator-based usability evaluation methods, and automatic website evaluation tools (Stolz, Viermetz, Skubacz, & Neuneier, 2005). In other words, it is either manual or automatic process.

Manual evaluation includes experts or real user testing, while automatic assessments employ different software-testing tools. The output of such an evaluation is a list of usability problems and recommendations to improve the tested website.

The methodology that I aim to create is based on manual evaluation of a website. Thus, in this thesis, it is relevant to focus on *user- based* and *evaluator-based* evaluation methods because these methods are based on manual evaluation. Such division provides the reader with an overview of available methods, mentions their strengths and weaknesses. Moreover, based on the review I can explain what I am missing in traditional methodology and why the method that I suggest is beneficial for specialists in IA.

To sum up, in this thesis, it is appropriate to adopt Stolz's classification of WSEMs (Stolz et al., 2005). However, in my analysis I leave out automatic website evaluation tools and focus mainly on human-based evaluation methods of websites because in my thesis I aim to suggest another human based WSEM.

Evaluator-Based usability evaluation methods

This section addresses popular usability methods that involve evaluators in the process of identifying usability problems.

Nielsen and Mack labelled evaluator-based evaluation methods as *usability inspection methods* and defined these as "a set of methods based on having evaluators inspect or examine the usability aspects of a user interface" (Botella, Gallud, & Tesoreiro, 2011; Nielsen & Mack, 1995, p. 170). These methods are aimed at finding usability problems that users encounter while interacting with an interface. When problems are identified, the specialist must make recommendations that should improve the usability of UI.

The following methods are the most common methods that belong to this category: heuristic evaluation, pluralistic walkthrough, cognitive walkthrough, formal usability inspections, feature inspection, consistency inspection, standards inspection, guideline checklists, etc.

Heuristic evaluation

Heuristic evaluation is a usability method developed by Nielsen and Molich (Nielsen & Molich, 1990). A heuristic evaluation is a website evaluation technique that "tests a web site against a formal or informal set of design guidelines (Morville, 2007, p. 240). This method involves having a number of evaluators that assess the user interface and judge whether it conforms to a set of usability principles (namely 'heuristics') (Nielsen & Molich, 1990).

Nielsen identified a set of ten usability heuristics, which were: visibility of system status, match between the system and the real world, user control and freedom, consistency and standards, error prevention, recognition rather than recall, flexibility and efficiency of use, aesthetic and minimal design (Nielsen, 1994).

Usability principles were aimed at helping usability experts to recognize and diagnose usability problems in an existing user interface. Based on their findings, usability experts should help to improve the system. Nielsen supports, "heuristic inspections appear to result in more overall predictions and better predictions of end-user problem types than cognitive walkthroughs" (Nielsen & Mack, 1995, p. 14). Jefferies et al. in their comparative study found that heuristic evaluations produce best results because this method identified the most usability problems, reporting one-third of the most severe problems and two-thirds of the least severe (Jeffries, et al., 1991).

I think that this technique is good because it allows studying the interface in real-world conditions where evaluators gather data directly from the website and immediately report on problems that arise during the interaction with the site. Moreover, the method has many advantages because it is relatively fast, cheap and easy to use. Morville supports that this method provides a "good balance between cost and quality" (Morville, 2006, p. 240).

However, the method has limitations. Firstly, making a heuristic evaluation requires a certain level of knowledge and experience (Nielsen & Mack, 1994). Usability experts with domain knowledge can be hard to find and expensive to hire (Jeffries et al., 1991). Besides, evaluators may not be familiar with technical limitations of the resource. Finally, chosen method does not guarantee assessing all problems during evaluation. Instead, participants can find low-priority or one-time problems.

Moreover, Nielsen believes that during evaluation different people may find different usability problems. Nielsen supports, "it is possible to improve the effectiveness of the method significantly by involving multiple evaluators" (Nielsen & Mack, 1994). This became evident after a case study where Nielsen et. al. found out that it was not possible to identify the best evaluator, and hardest-to-find usability problems were identified by people who do not find many usability problems(Nielsen & Mack, 1994).

Moreover, some researchers indicated that the original set of heuristics developed by Nielsen was too general and vague because they were formulated to evaluate screen-based information system (Preece, Rogers, & Sharp, 2002, p. 27; Sharp, et al., 2007).

Therefore, later heuristics were reinvented specifically for evaluating websites:

- **H**igh-quality content
- **O**ften updated
- **M**inimal download time
- **E**ase of use
- **R**elevant to users' needs
- **U**nique to the online medium
- **N**et-centric corporate culture (Nielsen, 2000, pp. 380–382).

A HOME RUN is a holistic test that a website has to pass in order to meet users' requirements and needs when users interact with the websites. They are based on Jakob Nielsen's experience in the field of user experience since the 1980s and up until today.

Despite the criticism of Nielsen's ten heuristics, it is worth mentioning that researchers are still advised to include Nielsen's heuristics as part of the design guidelines to evaluate usability of websites (Preece et al., 2002, p. 409; Sharp, et al., 2007).

Thus, Preece states "different sets of heuristics for evaluating toys, WAP devices, online communities, wearable computers, and other devices are needed, so evaluators must develop their own by tailoring Nielsen's heuristics and by referring to design guidelines, market research, and requirements documents" (Preece et al., 2002, p. 409). In other words, evaluators might benefit from developing their own case specific heuristics by tailoring Nielsen's usability principles and by referring to other sources. In this case, I refer to IA principles and design guidelines. However, I realize that offered heuristics do not fit all cases, are debatable, and depend on a product.

Pluralistic walkthrough

This is a usability inspection method that involves a group of evaluators, including representative users, developers and usability experts, evaluating a user interface by "walking through" the steps of a task scenario (Hollingsed & Novick, 2007; Nielsen & Mack, 1994).

"Pluralistic walkthroughs are another type of walkthrough in which users, developers and usability experts work together to step through a [task] scenario, discussing usability issues associated with dialog elements involved in the scenario steps" (Nielsen & Mack, 1994, p. 5).

The group discusses the usability issues of an interface related to each step in a scenario (Nielsen & Mack, 1994, p. 5). The scenarios are presented in the form of a number of screenshots that represent a single path through the interface (Preece et al., 2002; Sharp et al., 2007).

As indicated by Hollingsed and Novick, this method is defined by five characteristics:

1. Inclusion of representative users, product developers, and human factors professionals;
2. The application's screens are presented in the same order as they would appear to the user;
3. All participants are asked to assume the role of the user;
4. Participants write down what actions they, as users, would take for each screen before the group discusses the screens; and
5. When discussing each screen, the representative users speak first (Hollingsed & Novick, 2007, p. 251).

One of the benefits of the pluralistic walkthrough method is that "interface is not fully developed, enables rapid iteration of the design cycle, and—because the users are directly involved—can result in "on-the-fly" redesign" (Hollingsed & Novick, 2007, p. 251). Moreover, this method allows gathering feedback directly from users who are directly involved in the evaluation (Hollingsed & Novick, 2007). Another benefit is that it focuses on users' tasks (Preece et al., 2002, p. 423; Sharp et al., 2007).

However, this method has its limitations. Thus, Preece notes that it is difficult to "get all the experts together at once and then proceed at the rate of the slowest. Furthermore, only a limited number of scenarios, and hence paths through the interface, can usually be explored because of time constraints" (Preece et al., 2002, p. 423; Sharp et al., 2007).

Research shows that "pluralistic usability walkthrough is widespread but that teams do not refer to it as such in published reports", rather, "the pluralistic feature of the walkthrough may have become such a standard practice that it need not be mentioned" (Preece et al., 2002, p. 251; Sharp et al., 2007).

"Cognitive walkthroughs involve simulating a user's problem-solving process at each step in the human-computer dialog, checking to see if the user's goals and memory for actions can be assumed to lead to the next correct action" (Nielsen and Mack, 1994, p. 6).

Cognitive walkthrough is a usability inspection method that focuses on evaluating whether an interface is easy to learn through exploration (Wharton, et al., 1994).

For each step the team, firstly, defines who the target users are, create a sample tasks for evaluation, defines action sequences for completing the tasks, and creates description or implementation of the interface. Secondly, experts from different study fields come together to do analysis. Thirdly, the evaluators walk through the action sequences for each task placing it within the context of a typical scenario. Fourthly, when the walkthrough is done, experts make a record of critical information that explains what would cause usability problems and why users would face difficulties. Finally, the design should be revised and all problems must be fixed (Rosenfeld et al., 2015; R. Spencer, 2000b; Wharton et al., 1994).

This method has a number of key advantages. Firstly, it is easily learned by team members. Secondly, the method can be used on early stage of development. Thirdly, it is a wonderful tool for generating design ideas due to sharing of ideas among all team members, who usually have different backgrounds and perspectives. Fourthly, team members gain knowledge faster about the system under review (Fichter, 2004). Finally, this method focuses on users' problems in detail, even though users are not involved in the process (Sharp et al., 2007).

The method, however, has drawbacks. The major drawback is that the method is time consuming and tedious (Preece et al., 2002, p. 429; Sharp et al., 2007). Besides, "the choice of task scenario can be difficult; if the scenario is not adequately described, the evaluation is not as effective" (Hollingsed & Novick, 2007, p. 251).

Guideline reviews

"Guideline reviews are inspection method where a user interface is checked for conformance with a comprehensive list of guidelines" (Baecker, 2014). This method is similar to heuristic evaluation method because it also contains broad guidelines and involves checking an interface for conformance with these guidelines. However, heuristic evaluators use a short list of guidelines, whereas, guideline reviewers use a longer and more comprehensive list (over 1000 guidelines)(Baecker, 2014; Gray & Salzman, 1998; Lazar, 2006). Therefore, this kind of reviews take a long time to complete and, consequently, they are fairly rare in practice (Baecker, 2014).

Consistency inspections

This is a usability method where an expert reviews all product range from the same developer to ensure that products' design is consistent in terms of layout, terminology and colour (Lazar 2006). This method is used to inspect consistency across multiple products. For instance, whether common functions across products look and work the same way across a range of products. The consistency in interfaces is important because they increase users' performance and satisfaction level, decrease the error rate, as indicated by Lazar (Lazar 2006).

Standards inspection

Standards inspection is a usability method that involves an expert examining whether an interface complies with interface standards which are followed by other systems in the same market (Nielsen and Mack 1994).

The standards are usually written in formal language and, therefore, to perform this type of inspection, an expert who is familiar with the standard and its language is required (Stone, et al., 2005).

An example of a usability standard is ISO 9241 that is international standard for human computer interactions (HCI) (Stone et al. 2005). ISO 9241 includes requirements and recommendations regarding the attributes of the hardware, software, development process, usability and other related issues. Standards explain general principles, give recommendations and help access conformance of software to the main principles HCI (Bevan, 2006).

User-Based usability evaluation methods

This section includes the most commonly used methods that involve users into evaluation and are used to evaluate the usability of websites.

In general, these methods aim to collect feedback from users, record their performance, and evaluate their preferences during interaction with a user interface that is being tested. The most common method in this category is *user testing* method. The other methods are either variations of this method or supplementary techniques that can accompany this method.

User testing

The user testing method is considered to be the most important and fruitful approach in testing users because it provides information about how real users use the interface (Nielsen & Mack, 1994). So, it illuminates exact problems, which users encounter during the interaction (Nielsen & Mack, 1994).

Dumas and Redish defined the user testing method as "a systematic way of observing actual users trying out a product and collecting information about the specific ways in which the product is easy or difficult for them" (Dumas & Redish, 1999, p. 12).

User testing often takes place in controlled environment. Preece supports, "user testing involves measuring the performance of typical users doing typical tasks in controlled laboratory-like conditions" (Preece et al., 2002, p. 429; Sharp et al., 2007). Moreover, "usability testing relies on a combination of techniques including observation, questionnaires and interviews as well as user testing" (Preece et al., 2002, p. 429; Sharp et al., 2007). Thus, usability testing is supplied with a supplementary user monitoring techniques that captures users' performance (e.g. notes, audio, video or interaction log file) and satisfaction (e.g. questionnaires, interviews) (Dumas & Redish, 1999; Nielsen, 1993; Preece et al., 2002; Rubin & Chisnell, 2008; Sharp et al., 2007). Typically user testing involves 5-12 users (Dumas & Redish, 1999).

Think-Aloud method

This is a user testing method that tests an existing user interface where the users are asked to think aloud during the interaction with the user interface (Lazar, 2006; Nielsen, 1993). Preece explains, "the technique requires people to say out loud everything that they are thinking and trying to do, so that their thought processes are externalized" (Preece et al., 2002, p. 365; Sharp et al., 2007). "By verbalizing their thoughts, the test users enable us to understand how they view the system, and this again makes it easier to identify the end users' major misconceptions" (Holzinger, 2005, p. 73; Nielsen, 1993).

Holzinger indicated that "thinking aloud method (THA) facilitates a direct understanding of which parts of the dialogue cause the most problems" (Holzinger, 2005, p. 73). Besides, Holzinger specified the method's advantages that among others "reveals why users do something" (Holzinger, 2005).

Advantages of thinking aloud method, among others, include "revealing why users do something; providing a close approximation to how individuals use the system in practice; provision of a wealth of data, which can

be collected from a fairly small number of users; user comments often contain vivid and explicit quotes; preference and performance information can be collected simultaneously; THA helps some users to focus and concentrate; and early clues can help to anticipate and trace the source of problems to avoid later misconceptions and confusion in the early stage of design" (Holzinger, 2005, p. 73).

However, the think-aloud method has some disadvantages. Disadvantages, according to Holzinger, include "a failure to lend itself well to most types of performance measurement; the different learning style is often perceived as unnatural, distracting, and strenuous by the users; nonanalytic learners generally feel inhibited; and this method is time-consuming since briefing the end users is a necessary part of the preparation" (Holzinger, 2005, pp. 73–74; Van den Haak, M. & de Jong, M. 2005).

Questionnaires and interviews
Interviews and questionnaires are considered to be one of the most important data-gathering techniques. Interviews and questionnaires are useful and simple techniques that collect different kinds of information about users (Preece et al., 2002; Sharp et al., 2007).

Interviewing and questioning involves asking questions and getting answers from participants in a study. "Questionnaires and interviews are very similar methods since both involve asking users a set of questions and recording their answers" (Nielsen, 1993, p. 210).

There are many interview forms including individual, face-to-face interviews and face-to-face group interviewing. Interviews can be mediated by electronic devices. Interviews can be structured, semi-structured, unstructured and focus groups interviews. Depending on the nature of the question, questionnaires can be divided into: open or close ended questionnaires, mixed questionnaires or pictorial questionnaires.

These methods can be used as supplementary techniques to the user testing method. Besides, they could be used as standalone information collection methods. In the latter case, however, these techniques are considered as indirect usability methods because they do not study the user interface directly; instead, they reflect users' opinions about that interface (Holzinger 2005; Nielsen 1993).

Using surveys has many advantages. Among them are the speed of data collection, low cost to the researcher, instant access to the wide audience, short response time, large amount of information can be quickly collected from both a large and small group of users, users can be dispersed (Ilieva et al., 2002, p. 363).

However, these methods also have limitations. Dumas and Redish indicated that surveys "let you collect information about users' opinions attitudes, preferences, and their self-report of behavior, but you cannot use a survey to observe and record what users actually do with a product" (Dumas & Redish, 1999, p. 24). Therefore, data about "people's actual behavior should have precedence over people's claims of what they think they do" since their statements cannot always be taken at face value (Holzinger, 2005, p. 74; Ilieva et al., 2002, p. 364). Besides, interviews can also be very time consuming for both the interviewer and the participants. Moreover, "the success of the interview depends on the interviewer's ability to generate questions in response to the context and to move the conversation in a direction of interest to the researcher" (Zhang, et al., 2000, p. 3). Moreover, the method identifies only a low number of problems relative to the other methods (Holzinger, 2005).

Besides, the response rate in online questionnaires is comparatively low (Ilieva et al., 2002, p. 364). Finally, both surveys and interviews are indirect methods resulting in low validity (discrepancies between subjective and objective user reactions must be taken into account), and, therefore, this usability inspection method should be supported by other usability test methods. (Holzinger, 2005 p.74).

Focus groups

This is an informal method for collecting in-depth information about needs, choices and feelings of typical users about an interface (Dumas & Redish, 1999; Nielsen, 1993; Rubin & Chisnell, 2008). Redmond explains that this method is "a form of group interview where the aim is to understand the social dynamic and interaction between the participants through the collection of verbal and observational data" (Redmond & Curtis, 2009, p. 57). Often this method is used "at the very early stages of a project to evaluate preliminary concepts with representative users" (Rubin & Chisnell, 2008, p. 17).

In a focus group, about six to nine users discuss selected topics. For instance, with the assistance of a moderator, a participant should discuss website components on a predefined website. Thus, the method gathers information through the group setting.

Moreover, this method allows to identify, raise and discuss different relevant to a project issues and requirements. Thus, focus groups methods has some advantages. It highlights the areas of consensus and conflict, encourages contact between stakeholders and designers (Preece et al., 2002, p. 214; Sharp et al., 2007). Therefore, this method can provide useful insights on the problem area on a website and support the discussion how these problems should be solved. However, although this technique captures users' point of views, it does not measure users' actual interactions with an interface (Dumas & Redish, 1999).

Card sorting

Card sorting is a technique that can be used to involve users into a process of website evaluation with the purpose of obtaining feedback from them. The method involves sorting a series of cars labelled with content into categories that make sense to users. According to Jamil "is a reliable, inexpensive method for finding patterns in how users would expect to find content or functionality" (Jamil et al, 2015, p. 222). The mentioned patterns are often referred to as user's mental model (Harloff, 2005). Jamil explains, "the mental models provide ways to better understand the aspects that involve personal characteristics and insert them in software designs" (Jamil et al, 2015, p. 222).

There are several types of card sort: open, closed and hybrid. Spencer explains, when "you ask people to sort the cards into piles according to what's similar and describe the groups they make" open card sort (Spencer, 2009, p. 7). If you "give people a set of content cards plus a set of categories and ask them to sort the cards into the predetermined categories" it is closed card sort (Spencer, 2009, p. 8). Thus, "open is great for getting ideas on groups of content; closed is useful for seeing where people would put content" (Spencer, 2009, p. 8). A hybrid card sort is a mix of open and close card sort. In hybrid card sort IA specialist offers some predefined categories and allows participants to create their own categories during the card sort (Spencer, 2009). Thus, this method is useful if IA specialist has partially completed IA structure and he is interested in whether users feel convenient with offered labels or if they prefer another category labels.

This technique is popular among IA specialists (Spencer, 2009). Jamil explained, "the card sort technique can be considered a complement for activities such as usability evaluation and information need analysis" (Jamil et al, 2015, p. 222).

Thus, card sorting helps people to categorize items semantically based on their own perspectives. The result from card sorting experiments can be used as an input for making website categories and category labeling during IA development process. A website with categories that are defined by a user is convenient to use. However, if the website categories are confusing and not convenient for the user, the user might stop using the website (Spencer, 2009, p. 8).

This methodology is helpful because it provides a good foundation for the structure of the site. Besides, this methodology is unique, in my opinion, because it supports information architects with the physical evidence that the assumptions they hold on possible information architecture makes sense to other users. Spencer supports, "this is incredibly useful when you want to organize information in a way so that other people can find it" (Spencer, 2009, p. 8). Besides, the technique is cheap, simple to use, it involves real website users. Moreover, it is adopted by practitioners within the field of information architecture. Finally, card sorting assists IA practitioners in structuring the content in a logical manner that makes sense to other people.

However, the card sorting technique has some limitations. Firstly, it focuses only on structuring the content. It neither analyzes the flow of task nor ensures that the content meets users' needs (Spencer, 2009, p. 8) Secondly, after conducting analysis it is necessary to interpret obtained results. Analyzing results may take time (Spencer, 2009, p. 8). Thirdly, card sorting is "an aid to provide insights and help you create great solutions" (Spencer, 2009, p. 8). Fourthly, it is time consuming. Moreover, the method can give diverse results. Finally, labels in this method are not presented for users in context. Therefore, it is a good idea to support this technique with other approaches.

Other existing methods for evaluation of IA on websites

Finally, I would also like to mention some existing methods of evaluation of IA on websites. These methods are not well-established yet. However, these methods exist and, making my heuristics, I should also take them into an account because they evaluate IA.

In the early stage of every IA related project, information architects always conduct a research (Rosenfeld et al., 2015). The outcomes of the research identify and determine opportunities for improvements, give insights how to increase usability of the system, suggest ways how to make website content easily accessible and findable for users. Furthermore, information architects might evaluate IA after the redesign by comparing a website to a competitors' site, comparing the redesigned version to the previous version of the site, comparing several different approaches to designing structures (for instance, comparing broad and shallow structure versus narrow and deep structure for the same site) (Rosenfeld et al., 2015). Moreover, there are methods where IA specialists evaluate only one IA component. For instance, evaluating only labelling component Rosenfeld et al. offer to "walk through the entire system, either manually or automatically, and gather the labels" into a simple table in a single document "containing a list or outline of each label and the documents it represents" (Rosenfeld et al., 2015, p. 157).

Label	Destination's headings label	Destination's <TITLE> label

(Rosenfeld et al., 2015, p. 158).

Such overview should provide a breakdown of the navigation system labels. Rosenfeld et al. argue, "arranging labels in a table provides a more condensed, complete, and accurate view of navigation labels as a system" (Rosenfeld et al., 2015, p. 160). In other words, such breakdown allows seeing inconsistencies, missing titles, missing labels, style and capitalization inconsistencies that may be confusing to users. This method, however, has weaknesses. Rosenfeld et al. claim that "creating a labeling table is often a natural extension of the content inventory process" (Rosenfeld et al., 2015, p. 157). However, I think that it is not suitable for evaluating bigger websites because it is time consuming. Moreover, as Rosenfeld et al. mention, it is a continuation of content developing process, whereas my target audience, did not create a website content, but is trying to evaluate IA（Rosenfeld et al., 2015). Alike method is also suggested by Kalbach (Kalbach, 2007).

Besides, there is a method for evaluating on Navigation IA component (see Approaches in evaluating website navigation IA component).

To sum up, these methodologies are hardly applicable during the presentation of a new IA to a client because they are either time or resources consuming. Besides, they do not allow admiring a good website structure.

Therefore, in the thesis, I attempt to make an IA evaluation method that would be neither solely professional nor user based. I attempt to make an evaluation method that can be used both by professionals during presentation of the website and by website owners if they need to judge the website's structural design.

Generalizations on the available methodologies

In previous subchapter, I gave an account on the most popular website UEMs. Moreover, I elaborated on their strengths and weaknesses, mentioned in which product development stage they are traditionally applied.

Evolving Methodology

The number of website UEMs hints that web development is a complex and challenging process that involves interaction with a numerous heterogeneous design techniques (Murugesan, 2008). Besides, Murugesan suggests, that the development of a web system is a continuous process with an iterative life cycle of analysis, design, implementation, and testing (Murugesan, 2008). Although the development of web applications has evolved into a discipline, there is still a lack of an engineering approach for constructing web systems, and the entire development process is still in process (Ahmad, Li, & Azam, 2005). Therefore, new website evaluation methods still evolve. For instance, card sorting is relatively new UEM. Thus, the field of websites evaluation is still evolving because people involved in web design developments are still suggesting new ways of website evaluation. In this review, due to my problem formulation, I gave an account of primarily well-established sources.

Used literature

After making a UEM review, I also realized that I base my review primarily on older literature sources. I think that it happened because the methods that evaluate websites are rather old and were settled down 15-25 years ago. It might occur because it takes time to make the method, publish it and wait until the methodology is adopted by practitioners. In my problem statements, however, I aim to use theories and methods that are widely adopted and used by specialists within the field of IA. Therefore, older literature also supports answering my problem statement.

Moreover, the literature is old because in the last decade website developers have been focused on developing mobile friendly websites (Krug, 2006; Rosenfeld et al., 2015). Thus, a few articles on desktop design development were produced during this period.

Furthermore, the last few years aroused a need for responsive websites, single page websites, websites with unusual navigation, etc. These trends can be observed on Awwwards website that recognizes and promotes web design trends, efforts of the best developers, give awards for design, creativity and innovation on the Internet (Awwwards, 2015). Rosenfeld et al., by the way, criticize these trends "designers must be judicious when experimenting with new and untested navigation schemes (Rosenfeld et al., 2015, p. 179). Moreover, I must admit that I agree with their critique because I think that, in terms of IA, modern trends are a step back in development of web design. Thus, due to newly emerged web design trends practitioners were primarily focused on improving emerging type of websites and did not produce much theories on desktop design development.

Besides, user expectations of websites that can function on mobile devices are high. Thus, the consumers shaped a web design trend, where consumers would like to have mobile friendly websites that work effortlessly on mobile devices. Therefore, usability evaluation methods, as well as other web design oriented literature, have been constantly modified to better support the evaluation of mobile friendly websites. Probably, this is the reason why the most recent literature is focused primarily on mobile friendly web design. And, consequently, choosing to focus on desktop websites, in the thesis, I address an older resources.

Evaluation methods

In general, introduced methods evaluate different website usability aspects. The choice of methodology depends on the purpose and objectives of the evaluation, what aspect of the site is under review, project stage, etc. For instance, evaluation of log files, navigation, etc. Moreover, the choice of methodology depends on adopted for the project usability definition that web developers had in mind. Therefore, there is no single method for evaluating websites' usability.

Given the importance of a well-designed website structure, it seems that in these methodologies no one attempted to evaluate the web site architecture. Thus, practicing and studying IA, I run into a problem that there is no methodology that evaluates structural components of IA on websites. Moreover, surprisingly few website owners considered to evaluate the architecture of their website before making redesign of their websites (Rosenfeld et al., 2015).
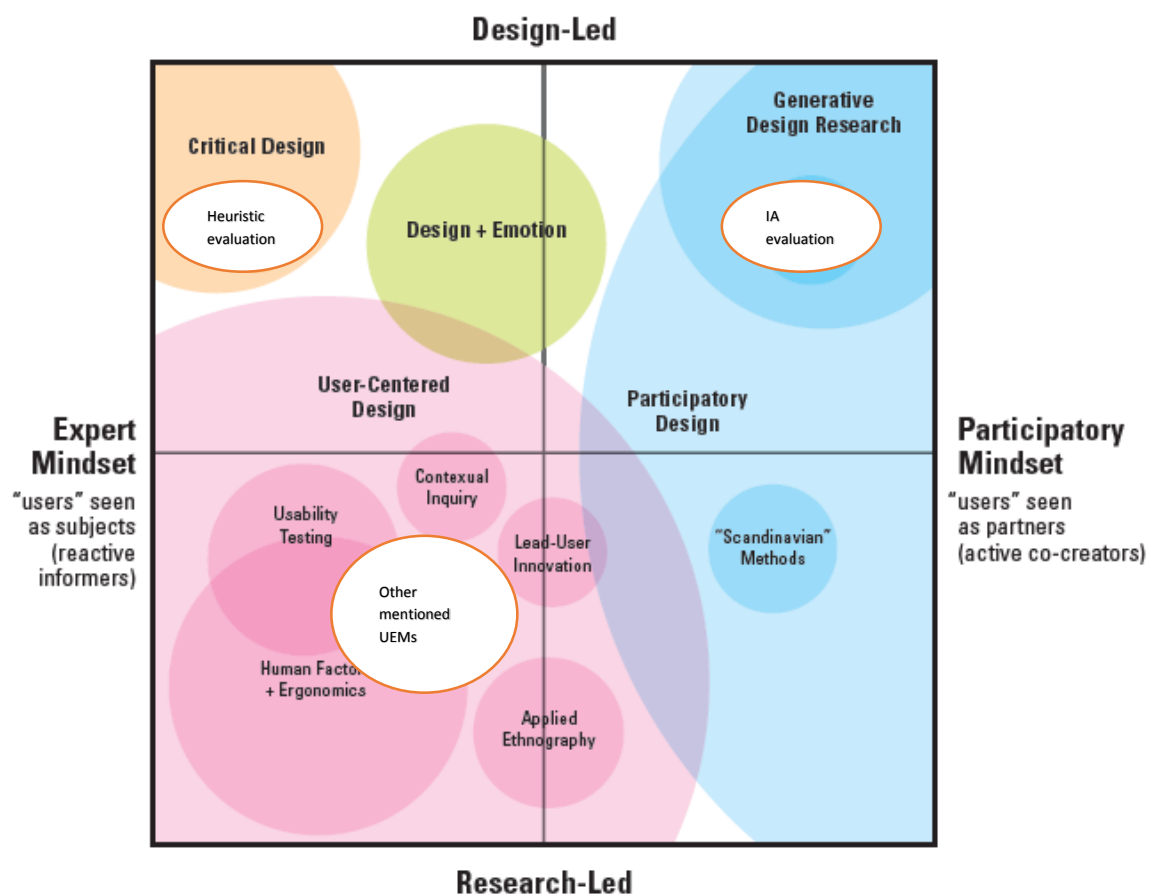
Figure 3-3 Heuristic evaluation and IA evaluation

Moreover, the review suggests that introduced website UEMs are almost all based on User-Centered Design (UCD) because all of them are focused on a product that they are going to design and seek ways to ensure that it meets the needs of their user. The exception, in my view, is a Nielsen's heuristic evaluation (see Heuristic evaluation). Sanders supports "in user-centered design, the roles of the researcher and the designer are distinct, yet interdependent. The user is not really a part of the team, but is spoken for by the researcher" (E. Sanders, 2002, p. 1). Moreover, majority methodologies target end-users. There is no methodologies that take into account stakeholder opinion.

Thus, if I should roughly place all discussed in the paper methods into Sanders' map of design research, they almost all would appear in "expert mindset" dimension because they use users as a source of information to improve design they make. Moreover, almost all methods are research based, therefore they should be placed into a research led. Nielsen's heuristics and card sorting, however, might be placed into design led. Card sorting, however, even though, it is also a design oriented method, cannot be used on a final design stage of a project. Therefore, I do not consider it as a relevant methodology for answering my problem statement. I place Nielsen's heuristics in the design-led because it is a methodology that is based on a set of rules that designers offer to people who then compare a website to these rules and respond to designers, providing insight for a design process. Heuristics are a part of iterative design process, it is a method for finding the usability problems in a user interface (Nielsen, 1995). Heuristics, in my view, provide design inspiration rather than giving guidelines how to improve a user experience on a website. Therefore, I suggest basing the toolkit for evaluation of IA on heuristics.

What inspires me at Nielsen's heuristics?

In my decision to make heuristics for stakeholders to evaluate website structure, I was inspired by Nielsen's heuristics because heuristics are also a set of rules that allow a person to test a website against a set of rules and, on their basis, suggest improvements for an existing system.

I believe that this method is appropriate for people who are not involved in the field of IA because it is easy to conduct and leads to immediate results. Moreover, it identifies problems that have a fairly obvious fixes, when they are identified (Mack & Nielsen, 1994). Furthermore, the method is used in a final stage of a project when the system is designed and ready to use. Finally, the idea of comparing a system against a prompting statement is, in my opinion, prosperous because statements can be used as a foundation for building strong arguments in a dialog with a client.

What is missing from the heuristic evaluation approach?

However, I think that it is not efficient just to tailor existing heuristics. There are a few reasons why I think so. Firstly, Nielsen's heuristics are not designed to evaluate IA of the website. Thus, I find that both suggested heuristics are too broad and shallow because they prompt to specific features that promote usability and, therefore, are relevant only for usability evaluation, rather than for pointing on a problem in IA. Secondly, heuristics do not give an immediate reasoning and require a certain knowledge within the field. Thus, it is not suitable to offer these heuristics to a client, if a client would like to get a clarification on why the system is build the way it is. Thirdly, the client should be able to do it alone or in-group with other stakeholders. Finally, heuristics for stakeholders should not require any knowledge within the field of IA. Thus, every rule should stand for itself.

Thus, if I place Nielsen's heuristics into Sanders' map of design research I would place it into *Design Led with Expert Mindset* because the techniques is targeted for professional use (see Figure 3-4). However, the evaluation I want to offer should also be in design led, but, contrary to Nielsen's heuristics it should have a participatory mindset. Thus, it should be targeted on non-professionals.

Some researchers suggest developing a case specific heuristics for each project (Preece et al., 2002, p. 24; Sharp et al., 2007). Among other reasons, this suggestion inspired me to make specific heuristics for evaluation that evaluate specifically website structure and can accompany me in every IA related project.
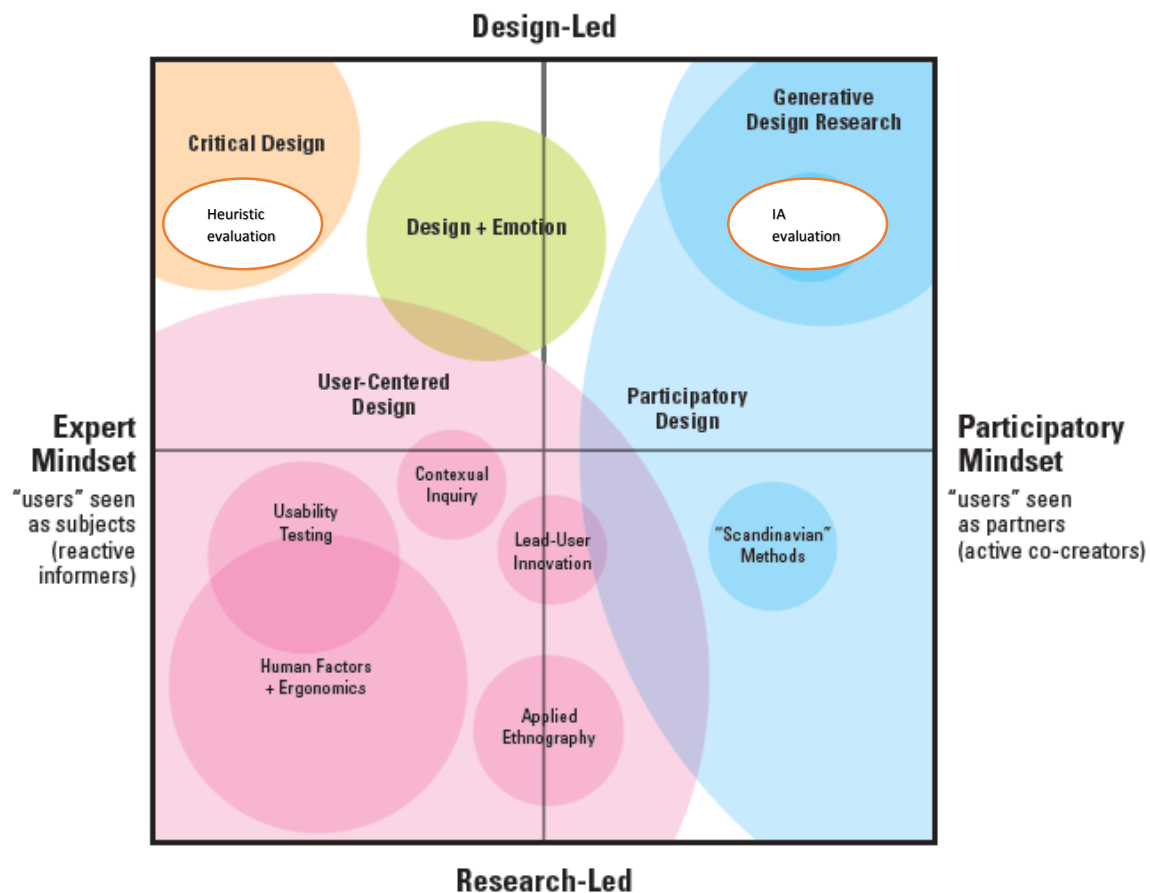
Figure 3-4 Heuristic evaluation and IA evaluation

To explain my idea further, I come with the example of Rosenfeld's et al. polar bear book. Thus, Rosenfeld et al. walk us through a complete process of developing solid IA structure (Rosenfeld et al., 2015). In their book, they provide a systematic instruction how to develop a solid IA structure for a website. However, they suggest using tools that are appropriate for an individual IA case. Therefore, in the process of researching, designing and developing IA, IA specialists use different tools that fit to the project requirements. Nevertheless, IA specialists have some common theories (grounds) for all IA related projects. For instance, the concept of IA ecology, four IA components, information scent, navigation components, etc. These background theories remain unchanged for every IA project. Therefore, I have a hypothesis that these common grounds might form a background for heuristics that evaluate website structures.

Heuristics as a basis for a toolkit

As mentioned earlier, I suggest to base evaluation of shared IA structure of websites on principles of heuristic evaluation. I think that it is an optimal solution for my problem statement because heuristics can be used to test a website against a set of predefined statements and, on their basis, get immediate results, suggest improvements for an existing system (see What inspires me at Nielsen's heuristics?).

Moreover, Nielsen's heuristics and the methodology that I need are design oriented. However, they target users that have different level of expertise. Thus, if I should position this methodology into Sanders' map of design research, I would place it on the opposite site of Nielsen's heuristic evaluation into design led with participatory mindset (see Figure 3-4).

To adapt this method to my target audience:

Firstly, I need to base heuristics for evaluation of IA on relevant IA theories. Thus, formulated heuristics must be fairly general because they should be applicable for evaluation of most desktop versions of a website. Thus, the toolkit might be based on general heuristics that facilitate finding the IA usability problems on a website. The method involves judging the compliance with recognized principles (the "heuristics") (Nielsen, 1995).

Secondly, each heuristics should contain explanation and, if possible example. Explanation should, in my view, be common grounded and easy to understand. It should explain why the rule(s) is(are) there, why it(they) is(are) important.

Thirdly, I suggest another appearance for IA heuristics. According to my problem statement, heuristics should be based on a toolkit. The complete toolkit should evaluate all four IA components. It should contain heuristic rules, explanations, clarify how evaluation should occur; answer on all upcoming questions regarding evaluation , etc. Moreover, I imagine that the toolkit should be primarily visual because it should serve a common ground for connecting thoughts and ideas of people from different grounds and perspectives. For instance, the toolkit might be introduced to evaluators in form of cards. Sanders supports, such methodology should "facilitate exchange between the people who experience products, interfaces, systems and spaces and the people who design for experiencing" (Sanders, 2002, p. 4). For simplicity, however, suggested heuristics would be introduced in the form of an evaluation. In the thesis, however, I focus only on evaluating navigation component of IA.

I think that these improvements will allow me to target non-expert users with my toolkit.

Formulating Requirements to Methodology

Based on ideas introduced in this chapter, I try to bring the methodology further and formulate requirements for the methodology that I aim to suggest.

My primary target audience is website owners. They are not end users, but rather stakeholders of the site. I need a tool that would *let website stakeholders directly and proactively participate in website structure evaluation and presentation process.* In other words, *I aim to suggest a methodology that is based on participatory experiences*. Sanders explains "in participatory experiences, the roles of the designer and the researcher blur and the user becomes a critical component of the process" (Sanders, 2002, p. 2).

The methodology that I offer to make, in fact, *should help to access and evaluate the structure of information environment (IE)*.On the one hand, the methodology should facilitate specialists in information architecture that would like to reduce internal pressure and convince stakeholders to make suggested changes into their shared information environment.

On the other hand, the evaluation method (EM) must facilitate evaluator(s) who is(are) not involved into the field of information architecture but face the need to be able to access existing shared information environment. This need can arise if, for instance, a client needs to justify a presented design or if an owner of an existing information system wants to assess its design of information environment (IE) in context.

Therefore, I can conceive the evaluation that I aim to suggest has the following purposes and provides both evaluators and IA specialists with some unique possibilities:

Evaluator	IA specialist
• Evaluate the structure of the website • Appreciate or depreciate the product • Justify presented design • Assess the design of information environment in context	• Evaluation method that evaluates solely website structure • Listen what people say • Interpret what people comment using a toolkit • Make interferences what evaluators think • Reach understanding what the owners think about the design
• Ask questions • Come up with suggestions • Criticize the product	↔ • Involve owners into discussion • Defend his work

The table suggests that both evaluators and IA specialists benefit from such methodology.

However, the methodology that I attempt to offer has a significant drawback. When the website's IA is done it is costly to change and improve it. Kanstrup supports, "it is costly to react to user contributions in the form of new idea and suggestions for changes at late stages of design process"(Kanstrup, 2011, p. 13). However, this methodology is still helpful if an IA presents a website and need a tool that provides a foundation for building strong arguments in a dialog with a client.

Moreover, suggesting such methodology, I should also keep in mind that "we that (1) visitors of Websites will often not be highly knowledgeable and that (2) they have less attention available to focus on actively identifying coherence, even when they are "reading to learn" because they are forced to share their reading task with navigation tasks" (Spyridakis, 2000, p. 366).

I can sum up these ideas into the following objectives for the EM:

- Evaluate IA of the website
- Be applicable on a ready-to-use interface
- Be suitable for one person evaluation and group evaluation
- Be suitable for people that are not involved into the field of IA
- Every rule should stand for itself, be narrow and precise
- Provide immediate reasoning on why the rule is important.

These objectives support the general requirements for toolkit that I outlined in the Introduction (see Research question):

- *be based on widely accepted Information Architecture's theoretical foundation*
- *leave a sufficient room for interpretation in each individual case*
- *apply in majority of Information Architecture cases*
- *be used to justify Information Architecture design solutions*
- *take account of modern trends in websites*
- *be able to evaluate all existing shared information constructs*
- *be self-evident, require no prior knowledge, review IA visible components*

Summary

Summing up, in the chapter I reviewed the most common UEMs that are based on human evaluation, however, it seems that none of the mentioned methodologies can be applied or tailored to my case.

In this chapter, I got inspired with one of the UEMs evaluation, namely heuristic evaluation. I explained what inspires me in this method. Moreover, I clarified what is missing in this method and why I cannot tailor it to answer my problem statement. Furthermore, in this chapter I formulated requirements for the toolkit that I want to design. Finally, I explained how I could tailor the method to non-experts using a toolkit.

To sum up, I think that this methodology brings both IA specialist and evaluator into a new mindset where the user experience is in the focus and provides an inspiration for improvements and ideation. This methodology is all about the recognition that people (stakeholders in our case) also have attitudes about the design. However, they often miss a toolkit that helps to express themselves (E. Sanders, 2002). It is about viewing each website in context. It is about the participation and active involvement into the evaluation process. It is about understanding people who experience the ready product in context. It is about communicating the design to each other. Besides, it is an ongoing process, where stakeholders might change their view on a product, change their mind if provided a solid argument. It is also a matter of giving to evaluators the right toolkit that supports ongoing evaluation process, facilitates the presentation of ready to use product.

4. Theoretical foundation for the thesis

The field of Information Architecture is central for this thesis because I base theoretical part of my heuristics primarily on the definition of Information Architecture (IA). Therefore, in this chapter I explain why I have chosen Rosenfeld and Morville's theories as a foundation of my thesis. Moreover, I suggest a broad definition of IA, and explain why it is relevant for the thesis. Then, I elaborate on categorization that I choose for the heuristics. Finally, I clarify why I support Rosenfeld and Morville's theories with Kalbach's theories on website navigation.

Rosenfeld and Morville's theories as a foundation of the thesis

The foundation of this thesis constructs Rosenfeld and Morville's definition of IA, and categorization of information environments that they offer in their literature. Therefore, in this section, I explain the choice of theoretical background of the thesis from a wider perspective.

I have chosen to base my thesis on Rosenfeld and Morville's theories. This decision was made because, theories provided by authors, are acknowledged and recognized by practitioners. Moreover, the theories are referred to in literature and adopted in educational process. Their books provide a methodological and theoretical background for processes of structuring information on large organizational websites. Dillon and Turnbull wrote about a polar bear book: "this text is often referred to as the ''bible'' of IA, but its focus is on the practical rather than theoretical domain, with guidance on how to implement web sites and intranets that support management and growth of information" (Dillon & Turnbull, 2005).

Moreover, I have chosen to base my thesis on Rosenfeld and Morville's theoretical foundation because, among other systematic approaches, authors provide an evolving structured methodology for the practice within the field of Information Architecture. Besides, I find their theories relevant because these authors propose a structured methodology for web IA that is based on the expertise of information professionals. Furthermore, they suggest a sequence of steps within stages of research, strategy, design, and implementation that outline a structured design process for web IA.

With these points in mind, I can say that my heuristics rest on methodology that is based on solid practical experience and is acknowledged and recognized by practitioners. In turn, it gives me confidence that my heuristics can also be accepted by my target audience.

Defining Information Architecture

Many researchers and practitioners attempted to give a definition of IA (Dillon, 2002; Dillon & Turnbull, 2005; Evernden & Evernden, 2003; Hinton, Andrew, 2010; Rosenfeld, 2002; Rosenfeld, et al., 2015; Toms, 2002; Zachman, 1999). All definitions agree that IA makes a foundation for shared information environments and is critical for both users and organizations (Downey & Banerjee, 2010). However, some authors pointed out that a widely accepted definition of IA does not exist (Resmini, Byström, & Madsen, 2009; White, 2004). Later, Dillon & Turnbull also reported that there is no formal definition of IA that has been widely agreed upon. Recently, Rosenfeld again noted that a widely accepted definition is not yet defined due to a complexity of designing; good digital products and services in all definitions appear to be imperfect and limiting (Rosenfeld et al., 2015).

The definition that I use in this thesis is based on a belief that a perfect Information Architecture organization can be obtained through optimization of organization systems, labeling systems, navigation systems and search systems. Balance in these four IA components is targeted on support findability, manageability and usefulness of the system from infrastructural level to user interface level. Moreover, the definition comprehensively presents the field of study and general scope of Information Architecture. I use this

definition because it allows me to interpret the idea of structuring information spaces in a relatively narrow scope, namely looking into website structure as a seamless whole that consists of labelling, navigation, and organization and search components.

Rosenfeld et al. define Information Architecture as:

1. "The structural design of shared information environments

2. The synthesis of organization, labeling, search, and navigation systems within digital, physical, and cross-channel ecosystems

3. The art and science of shaping information products and experiences to support usability, findability, and understanding

4. An emerging discipline and community of practice focused on bringing principles of design and architecture to the digital landscape" (Rosenfeld et al., 2015, p. 25).

Why do I choose to go with this definition?

I find this definition useful for this thesis because this definition gives a broad perspective on the field of Information Architecture. To be more precise, the definition articulates several useful aspects that can serve a ground for the heuristics.

Firstly, this definition generally focuses on organizing information environments through such mechanisms as organization, labeling, search, and navigation systems. Such simplified categorization of IA components, in my opinion, improve understanding of the essence of Information Architecture (see Four IA components).
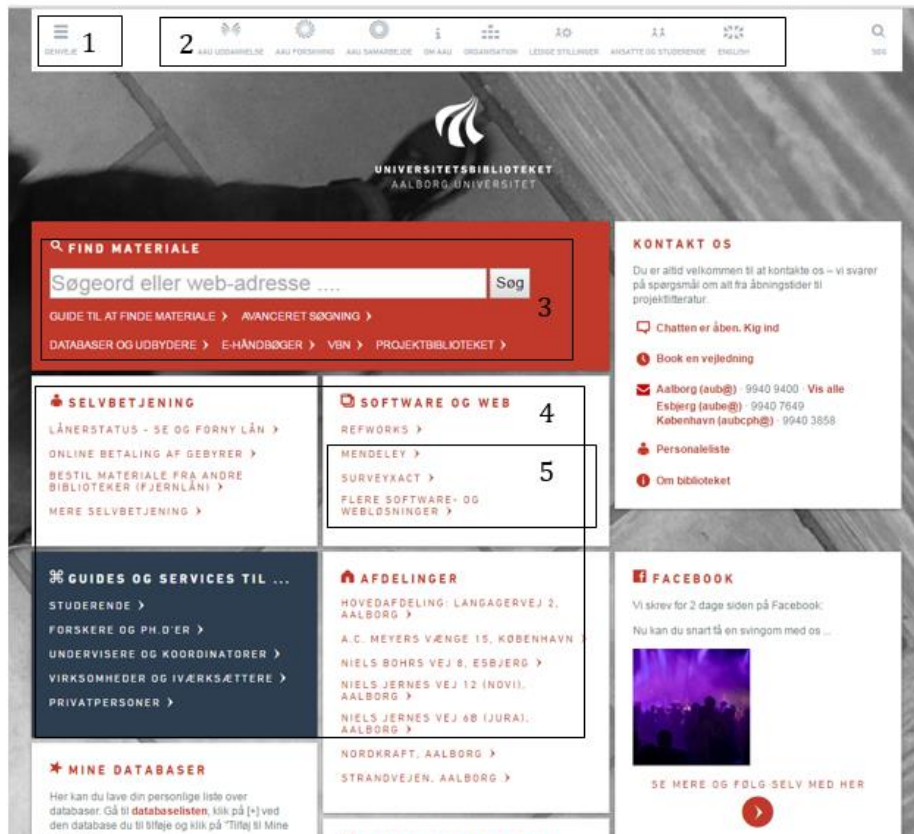
Figure 4-1 Four IA components on Aalborg University library page (AAU, 2016).

Therefore, Rosenfeld suggests viewing every information environment as a combination of these four components (see Figure 4-1).

This approach is relevant in this thesis because every website has a structure that can be described using these four components.

As stated earlier, in the thesis I aim to formulate a fairly general heuristics that can serve as a toolkit to evaluate existing Information Architecture on the websites. I think that Rosenfeld's components are a good starting point to answer my problem statement because they are applicable to all websites and are specially tailored to evaluate Information Architecture of a shared environment. Therefore, I think that it is reasonable to apply Rosenfeld's categorization of IA components in the thesis. Thus, I can formulate heuristics that are targeted for evaluation elements that belong to one of the IA components. In other words, I will divide heuristics into four groups. Each group of heuristics will evaluate one IA component.

Secondly, this definition also suggests that Information Architecture is all about organizing content in a given information environment into a meaningful structure. Moreover, it advocates that IA is all about describing content clearly and providing ways for people to find it.

I find this part of definition relevant to the thesis because heuristics that I want to formulate should be able to evaluate the system, content accessibility and availability. Besides, the heuristics should be able to evaluate the ability of the user to locate the information he is looking for on the website. Furthermore, the ability of the user to understand his surroundings in a given information environment should also be the focus in my heuristics.

Four IA components

In addition to a well-formulated definition of IA, Rosenfeld and Morville suggest a systematic approach for designing IA for shared information environments. Morrogh supports this approach, saying that "a structured design process—a method—introduces control or discipline into the design process" (Morrogh, 2003, p. 110). In other words, Morville and Rosenfeld present a *generalized, sequential approach* that incorporates research stage, strategy, design outcomes and deliverables into a "structured development process" (Morville, 2006, p. 231).

Rosenfeld suggests to break out Information Architecture into four components: organization systems, labeling systems, navigation systems and search systems (Rosenfeld et al., 2015, p. 90). Generally speaking, *organization systems* describe the way information is categorized on a page; *labeling systems* represent preceding content, *navigation systems* are ways how we move through information, and *search systems* provide ways to search for information (Rosenfeld et al., 2015, p. 90). Rosenfeld labels this framework "categorization scheme" that basically means that authors attempted to organize components from each information system into a broad system of categories.

These four components provide a conceptual framework for evaluating Information Architecture. This approach is relevant because all information environments can be described using these components. Therefore, I can use this framework for evaluation of IA of websites. Thus, the heuristics that I will formulate can be divided into four categories to evaluate IA's components of websites.

However, this system of categorization has its own challenges.

Firstly, some organization schemes do not have clear boundaries and, thus, their components may overlap. Accordingly, Rosenfeld points out that "it can be difficult to distinguish organization systems from labeling systems (hint: you organize content into groups, and then label those groups; each group can be labeled in different ways)" (Rosenfeld et al., 2015, p. 90). Lakoff explains that this overlap happens because, instead of focusing on creating some clear boundaries, suggested categorization is focused on a sort of family resemblance (Lakoff, 1987, p. 16; Wittgenstein, 1953, pp. 66–70). Thus, I keep in mind that different IA components may have different degree of overlapping.

Secondly, organization schemes comprise both visible and invisible components.

Morville and Rosenfeld explain this phenomenon with an *Information Architecture iceberg* model that suggests that every information environment has visible and hidden components (see Figure 4-2). The model implies that the user interface is a tangible product, which often becomes focused during the project, whereas, the invisible part of IA often stays overlooked. Morville argues that "most of our clients and colleagues focus on the interface, without appreciating the underlying structure and semantics" (Morville, 2006 p.390). In other words, when information architects present their solutions to clients, clients cannot see the core information structure. Instead, they observe visible components of Information Architecture and, consequently, judge only visible components of IA. Therefore, to answer my problem formulation, I formulate heuristics that are based solely on visible components of these organization schemes (see Figure 4-3).
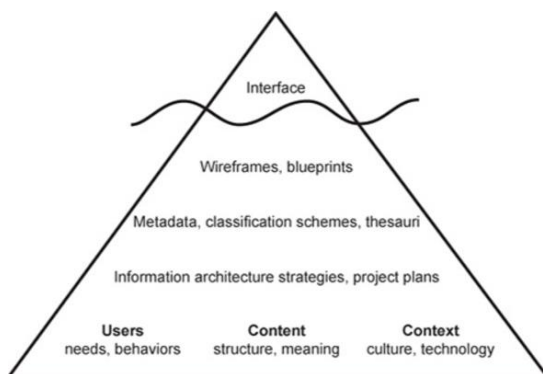
Figure 4-2 IA iceberg

Visible part
of IA

•In the thesis I focus on evaluating visible
components such as:
•Navigation system
•In future , I should also include in the evaluation
•Labeling system
•Visible organization structures
•Search interface and functions

Invisible part of IA

•My heuristics will not
cover invisible parts of IA.
An example of invisible
items are e.g.:
•Wireframes, blueprints,
metadata, classification
schemes, thesauri, IA
strategies
•User needs and behaviors
•Content structure and
meaning
•Context culture and
technology

Figure 4-3 IA visible vs invisible components

However, some IA constructs may lack several visible components due to their size, purpose, etc. Here comes the final third challenge of components categorization suggested by Rosenfeld and Morville. For instance, the search component may sometimes be omitted due to a size and purpose of the shared information environment. This challenge should be also reflected in a toolkit that should help to engage non-professionals into the evaluation of IA of existing website.

Designing website Navigation

In the polar bear book, Rosenfeld et al. refer to web navigation theories and concepts developed by Kalbach. I think that this book is in some way touches all aspects of web design, including the field of IA. Therefore, I find it is extremely useful in this thesis. The book is about website navigation. It takes a broader perspective on website navigation and situates website navigation in a broader concept of website development. Thus, in this book Kalbach, talking about navigation, overlaps with other IA related concepts, e.g. information scent, labelling, navigation, heuristic evaluation, etc. Thus, the book touches most aspects of website navigation in much greater detail then Rosenfeld et al. do. For instance, talking about navigation, Kalbach touches upon labeling, search, website's components evaluation, etc. Moreover, in his book Kalbach discusses various tools that are used for website navigation design, elaborates on ways to approach navigation problems. Therefore, I consider this book to be highly relevant in this thesis. Therefore, in the thesis, I use both Rosenfeld et al. and Kalbach as a sources that lay a foundation for my thesis. Finally, I find that these books support each other.

Summary

In this chapter, I gave a definition of Information Architecture and explained why I have chosen to use it. Furthermore, I explained why I have chosen Rosenfeld and Morville's theories as a foundation of my thesis, elaborated on categorization that I choose for the heuristics. Finally, I clarify why I support Rosenfeld and Morville's theories with navigation theories by Kalbach.

5. Suggesting heuristics for Navigation IA component

As mentioned in the introduction, I aim to suggest a suitable methodology for the evaluation of structural design of websites. The methodology should be based on a heuristic evaluation that is based on the toolkit, which enables non-experts to actively engage in the evaluation process and obtain meaningful results from evaluation. As discussed earlier, heuristics should be based on acknowledged IA architecture theories.

The main objective of this chapter is to establish these general heuristics for the evaluation of navigation component of IA.

To achieve this, in this chapter, firstly, I define what a website navigation is and elaborate on the issues it raises in digital worlds. Secondly, I give an account of methods used to evaluate navigation on websites. Thirdly, I draw from understanding of these issues implications for designing heuristics for the evaluation of websites' navigation. Finally, I suggest heuristics for the evaluation of navigation.

Defining of web navigation system

Using Internet becomes a part of many people's everyday life activities. Most people are used to reading news, booking a hotel room online, purchasing products and services though a website, planning a trip using online resources. Therefore, a primary objective of website developers is to make websites accessible for a wide variety of people. Moreover, people should be able to find information, products and services they need and use them. Thus, users access IE with some information needs and expectations to find a required information.

The first thing people interact with, entering a new information environment, is a navigation (Kalbach, 2007, p. 22).

Navigation is a tool that helps people to move around the information. Navigation system has several functions on the website. Kalbach explains, "web navigation: provides access to information, shows location on the web, shows "aboutness" of the site, reflects the brand, affects credibility impacts the bottom line" (Kalbach, 2007, pp. 5–6).

Navigationt includes navigation bars, hyperlinks, buttons and clickable images and graphics. Spenser supports that navigation "let people browse to the content or functionality they need, show the context of the information, shows what is related and relevant, help people find information they didn't know about" (Spencer, 2010, p. 257).

It helps to determine what is available in that environment and how to find a way around. Thus, Jul and Furnas describe website navigation as "the process whereby people determine where they are, where everything else is, and how to get to particular objects or places" (Jul & Furnas, 1997).

Kalbach argues that "web navigation is a systematic organization of links to provide access to information and to make meaningful associations" (Kalbach, 2007, p. 22). Besides, Kalbach states that navigation "provides access to information in a way that enhances understanding, reflects brand, and lends to overall credibility of a site" (Kalbach, 2007, p. 3). Navigations systems are important components that support browsing, provide access to information, indicate where and what can be found on the website. Moreover, navigation systems display location in a site, indicate "aboutness" of a site, reflect brand, affect site credibility, and indicate the bottom line (Kalbach, 2007, pp. 5–6).

Thus, navigation is considered as an important area in every IE (Chen & Czerwinski, 1997; Kalbach, 2007; Spool, 1999). Therefore, navigation is one of the crucial components on a website. Kalbach supports,

"navigation plays a major role in shaping our experience on the Web" (Kalbach, 2007, p. 3). Navigation on websites provides access to information, enhances our understanding of the content hidden beneath the website's structure. It reflects the brand, supports credibility of a site, provides means for finding information on a resource. Rosenfeld and Morville also note that a well-designed navigation system is the most significant issue that determines the success of the website (Rosenfeld et al., 2015). However, disorientation in cyberspace is still "one of the fundamental difficulties which users experience when trying to navigate within hypertext systems" that is investigated and attempted to prevent in modern IE (Otter & Johnson, 2000, p. 4).

These theoretical points are, in my view, summed up in a definition of navigation by Kalbach.

Kalbach offers to define website navigation with three statements:

1. "The theory and practice of how people move from page to page on the Web.
2. The process of goal-directed seeking and locating hyperlinked information; browsing the Web.
3. All of the links, labels, and other elements that provide access to pages and help people orient themselves while interacting with a given website" (Kalbach, 2007, p. 5).

I consider this definition as rather descriptive, solid and comprising because it touches upon both theoretical and practical aspects of website navigation. Moreover, it views navigation both as an engaging process of seeking and browsing, and as a selection of elements that help people to orient and interact in a given IE. Therefore, in this thesis I formulate my heuristics devoted to navigation IA component based on considerations that evoke this definition and its underlying theories.

Nevertheless, I think that I need to mention, that during the last few years, a surface layer of navigation was rapidly changing. Rosenfeld and Morville support, "in recent years, the proliferation of different device form factors has led designers and developers to come up with various strategies to deal with the widely varying screen sizes and interaction mechanisms" (Rosenfeld et al., 2015, p. 176). For instance, responsive web design and one page websites gain popularity. Therefore, in my heuristics I will attempt to reflect not only on well-established theoretical foundations of navigation design, but take into account contemporary web design trends.

Types of navigation systems

Despite new trends in web design, it is still the case that navigation systems of these websites are composed of several basic elements. Thus, Rosenfeld and Morville suggest that all websites have "the global, local and contextual navigation systems that are integrated within site pages (Rosenfeld et al., 2015, p. 176) (see Figure 5-1). Their purposes, according to Rosenfeld and Morville, are to "provide context and flexibility, helping users to understand where they are and where they can go" (Rosenfeld et al., 2015). However, Rosenfeld and Morville note that in modern reality these major systems, shown in a typical desktop layout, are "generally necessary but not sufficient by themselves" (Rosenfeld et al., 2015, p. 176). It happens because firstly, the "layout tends to take different forms given the compromises imposed by the limited screen real
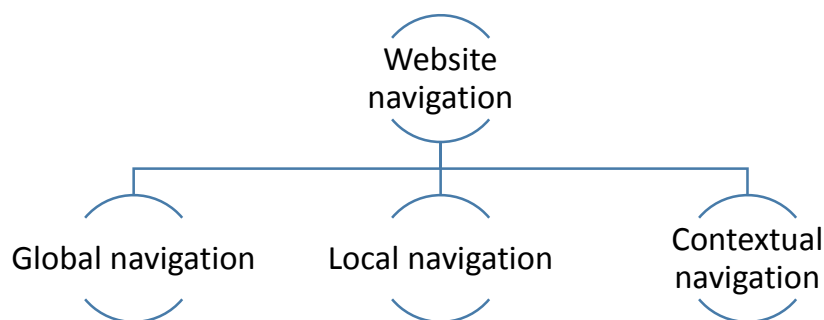
Figure 5-1 Rosenfeld and Morville's navigation categorization (Rosenfeld et al., 2015).

estate" (Rosenfeld et al., 2015, p. 176). Secondly, it takes place because new web design trends incorporate different models for navigation. For instance, one page websites use so-called internal web navigation to browse the website.

In this model, Rosenfeld and Morville label this type of web navigation as supplemental or contextual navigation system, whereas other literature sources e.g. Kalbach labels the same navigation types as associative navigation. Nevertheless, the purpose of supplemental (contextual or associative) navigation is "to provide different ways of accessing the same information" (Rosenfeld et al., 2015, p. 177).

These three navigation types support four main types of information seeking behaviors (see Figure 5-2). Thus, if a website supports known items search, exploratory seeking, don't know what I need seeking and re-finding, it satisfies main information seeking needs. Therefore, I may say that it targets a broad group of users.

	Known item	*Exploratory seeking*	*Don't know*	*Re-finding*
Structural navigation	X	X	X	
Associative navigation		X	X	
Utility navigation				X

Figure 5-2 Three types of Navigation Supporting Information Seeking behaviors

However, Rosenfeld and Morville's categorization has limitations. In my opinion, this categorization of navigation systems is too broad and leaves too much gray area for interpretation. Therefore, for this project I suggest using navigation categorization introduced by Kalbach. For this thesis I created a graphical representation of Kalbach's navigation categories (see Figure 5-3). To some extent, this categorization is similar to the one that is offered by Rosenfeld and Morville because it divides website navigation into global, local and contextual. However, Kalbach takes the categorization further by splitting contextual navigation into several categories that are grouped under associate navigation and elaborates more on supplemental navigation system that according to his classification is divided into utility navigation and internal page navigation (see Figure 5-3).

However, representing website categorization in such figure has some drawbacks. Thus the figure suggests that structural, associative, utility and internal page navigation are equally important on a website. This impression is not correct because e.g. local navigation cannot stay along on the website. Instead, it should support the global navigation. Moreover, in bigger IEs, one page navigation type cannot stand alone. Instead, these navigation types support each other.

I consider this categorization more appropriate because it shows the complexity of the field. Using this categorization, in my view, is easier to suggest heuristics rules for evaluation of navigation as IA component. For example, this categorization supports formulating a heuristic rule for one page website because Kalbach splits this type navigation into a separate category. Thus, using this categorization I might come up with heuristics that reflect modern web design trends.
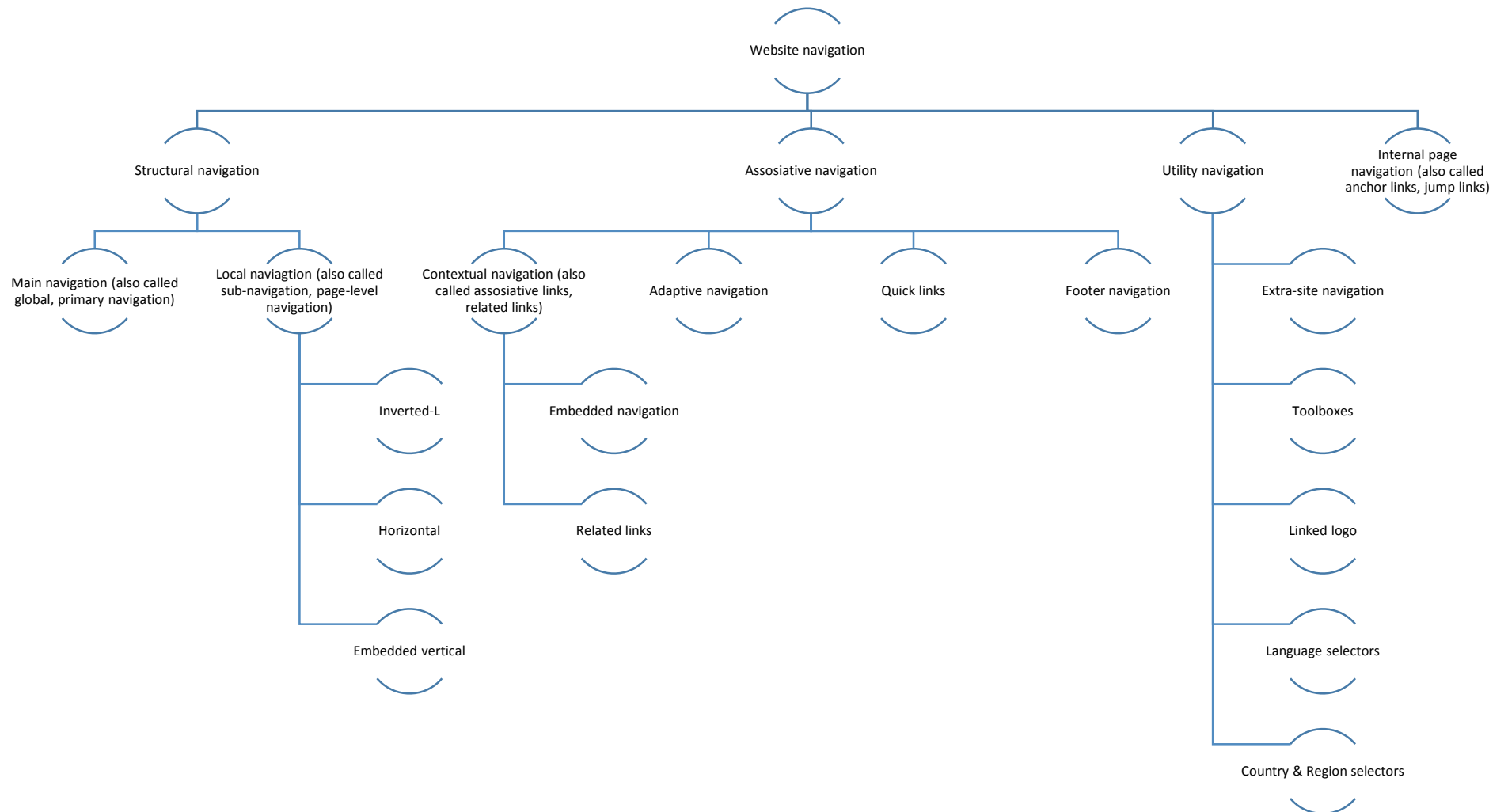
Figure 5-3 Website navigation categorization (Kalbach, 2007, pp. 86–104).

Accessing navigation

In the introduction I mentioned that primary target audience for the methodology that I would like to suggest are non-expert evaluators. Therefore, I try to base my heuristics on less theoretical background.

My literature review revealed, that some practitioners attempted to assign one or several question to evaluate navigation (Kalbach, 2007; Krug, 2006; Rosenfeld et al., 2015b). Thus, decent navigation on every website must answer one or several questions.

Mentioned authors, in fact, assign similar questions to evaluate navigation. However, they formulate questions slightly differently. For instance, Krug asks "What site is this?", "What page am I on?", "What are the major sections of this site?", "What are my options at this level?", "Where am I in the scheme of things?", "How can I search?", "What do they have here?", "What can I do here?" (Krug, 2006). Thus, Kalbach suggests that navigation should answer such questions as "Where am I?", What's here?", "Where can I go from here?" (Kalbach, 2007, p. 10). Rosenfeld and Morville take the same questions further and relate each question to a certain navigation system (see Figure 5-4).
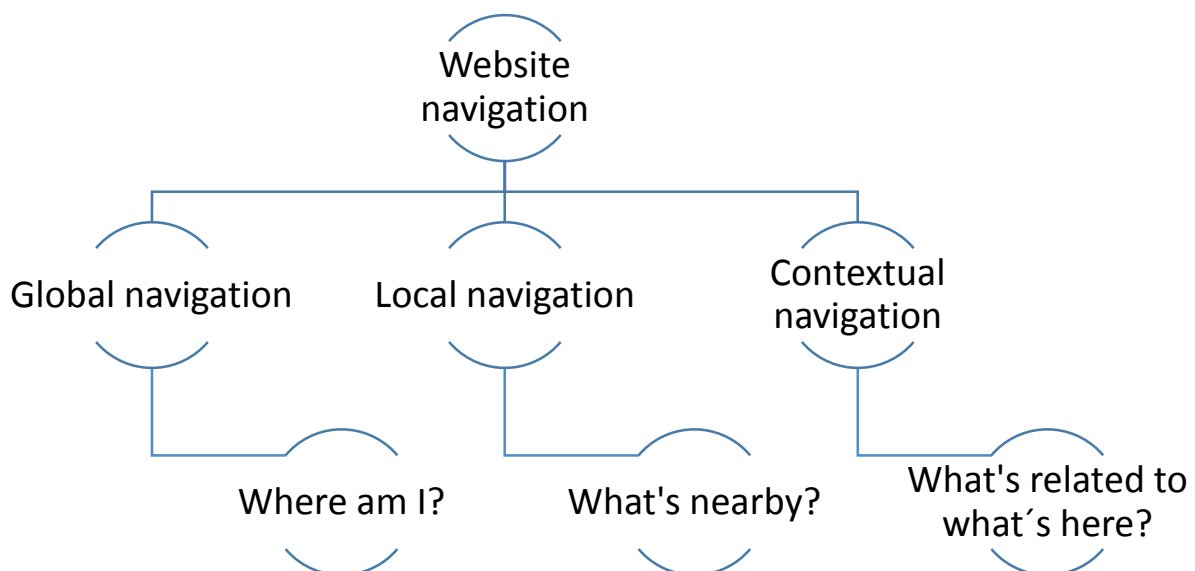
Figure 5-4 Rosenfeld and Morville's navigation categorization with questions (Rosenfeld et al., 2015).

Inspired by Rosenfeld and Morville, I think that assigning one or several questions to each web navigation category suggested by Kalbach could help me to target non-experts with my heuristics. It think so because answering a simple question e.g. "Where am I on a webpage?" is relatively easy even for non-experts. So, by suggesting such simple question, a toolkit points to a navigation type that should be evaluated by a heuristic rule(s). Thus, answering a question simplifies for non-expert a process of finding the right type of evaluation.

To sum up, I think that this approach is relevant to answer my problem statement because relating a question to a navigation system points on a relevant navigation type. Moreover, the question itself is thought provoking.

Having these points in mind, I attached one or several questions to main navigation categories in Kalbach's categorization (see Figure 5-5). For convenience, the same questions and navigation categories are represented in the table (see Figure 5-6).
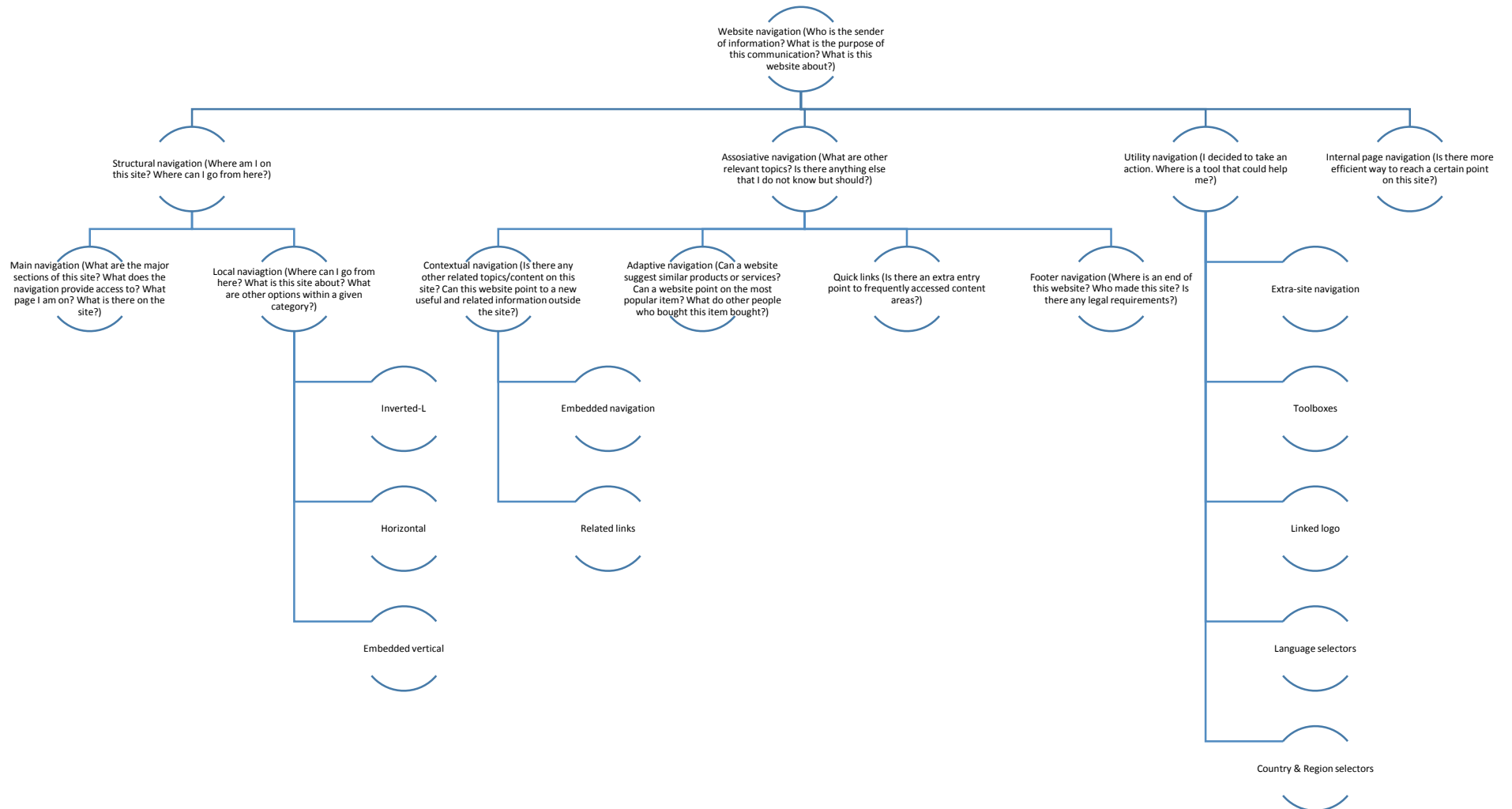
Figure 5-5 Kalbach's navigation categorization & questions

Who is the sender of information? What is the purpose of this communication? What is this website about?	Website navigation
Where am I on this site? Where can I go from here?	Structural navigation
What are the major sections of this site? What does the navigation provide access to? What page am I on? What is there on the site?	Global navigation
Where can I go from here? What is this site about? What are other options within a given category?	Local navigation
What are other relevant topics? Is there anything else that I do not know but should?	Associative navigation
Is there any other related topics/content on this site? Can this website point to a new useful and related information outside the site?	Contextual navigation
Is there an extra entry point to frequently accessed content areas?	Quick links
Can a website suggest similar products or services? Can a website point to the most popular item? What do other people who bought this item bought?	Adaptive navigation
Where is an end of this website? Who made this site? Are there any legal requirements?	Footer navigation
I need to log in to proceed. Where is an access point? I decided to take an action. Where is a tool that could help me?	Utility navigation
Is there more efficient way to reach a certain point on this site?	Internal page navigation
Does your site support browsers' built-in mechanisms as a supporting navigation option? Why does not this mechanism work?	Built in mechanisms in browsers

Figure 5-6 Questions assigned to navigation type

Suggested questions are based on Kalbach's, Krug's and Rosenfeld's et al. theories. According to Kalbach, **these questions reflect user's thoughts when interacting with a website** (Kalbach, 2007)**.** Thus, **answers to these questions could help to find an appropriate type of navigation for evaluation**. Rosenfeld explains, "each system solves specific problems and presents unique challenges"(Rosenfeld et al., 2015, p. 183). Consequently, to evaluate all navigation types, I should assign one or several heuristics to each navigation type. To make suggested heuristics for website navigation evaluation solid, suggested heuristics would be based on theoretical background provided by specialists within the filed. Thus, even though the toolkit is targeted on non-experts, it is based on a solid theoretical background.

I have chosen to base my heuristics on answers to simple questions because, firstly, these questions are the ones that users have when entering a new site. Secondly, they represent different types of navigation on the site. Thirdly, to a certain degree they follow a process of entering and exploring the site. Fourthly, answers to these questions, to a certain degree, explore IA structure of navigation systems; and, finally, they scratch the surface of the process of goal directed seeking and browsing.

I consider that evaluating website against heuristic rules, that are formulated for a particular types of navigation, helps to evaluate coherence and integrity of categories or groups of content objects. Thus, reviewing a website navigation using these question based heuristics evaluates how well a child content represents its parent. Besides, it could give a hint how representative the child is of his parent. In addition, it could help to identify categories with much overlap. However, conducting heuristic evaluation of a navigation can help to find only severe mismatches. Thus, conducting heuristic evaluation is not a methodology that prompts how to improve the navigation. Instead, it just points on a problem. In spite of that, the heuristics allow to appreciate a good IA. Therefore, they can be used by IA specialists to let the client admire a decent IA. By conducting heuristic evaluation, a client should see a reason why the items are grouped the way they are grouped.

However, this approach has its weaknesses. Navigation categories that are offered by Kalbach are subjective. Sometimes it is difficult to assign a navigation into one navigation category because it possesses features of other navigation categories. Kalbach supports, "in the real world, the boundaries are fuzzy and the lines get crossed every day" (Kalbach, 2007, p. 178). Moreover, the questions that I assign to navigation categories are also subjective and can be further discussed. Different authors attempted to formulate these questions, but they came up with different question formulations (Instone, 2000; Kalbach, 2007; Krug, 2006; Rosenfeld et al., 2015).Therefore, in the thesis I will either use the question that is formulated by practitioners or adjust it to be as neutral and universal as possible. Thus, I try to make the questions universal because they should be reused for different IA related projects.

To sum up, in this thesis, I base my work on assumption that, firstly, single evaluator of a group of evaluators by answering a simple question assigned to navigation should find a particular navigation type. Secondly, by evaluating a website against heuristic rules evaluators would spot IA usability problem that should be discussed either with other stakeholders or with an IA specialist. Finally, they should note their findings in a toolkit. In other words, supportive questions are there to help them to identify the correct navigation type. When the navigation is identified, evaluators should examine navigation's visible components in the interface and judge their compliance with the heuristic rules that are based on a recognized theories. Moreover, for inspiration and clarification evaluators can use examples that are included into a toolkit for inspiration. Evaluators should note the outcomes on evaluations scales provided in the toolkit. Evaluation results might be supported by evaluator's comments. Based on these judgments, IA of the website under the review might either be acknowledged or sent to re-design.

Approaches in evaluating website navigation IA component

Similar approach, to determine whether the site has a good navigation, was taken by Steve Krug (Navigation trunk test) and Keith Instone (Navigation stress test). The approaches are similar because methodologies are also based on answering simple questions about website navigation.

Roughly speaking, they also suggest answering three basic questions that users have in mind entering a website for the first time, introduced by Rosenfeld and Morville: Where am I?", "What's here?", "Where can I go?" (see Figure 5-4).

In the methodologies by Krug and Instone, however, Rosenfeld and Morville's questions are expanded into a more detailed review (see Figure 5-7). Methodologies are similar because they inspect website navigation from the point of view of usability of the site.

Navigation Trunk test	Navigation stress test
1. What site is this? (is there a site ID?) 2. What page am I on? (is there a page name?) 3. What are the main sections? (are there section names?) 4. What navigation options do I have here? (is there local navigation?) 5. Where am I overall? (are there "you are here" indicators?)	6. What's this page about? 7. What does each set of links represent? 8. What site is this? 9. What are the major sections of this site? 10. Which section is this page within? 11. What's one level "up" from this page? 12. How do I get to the top page for this section of the site? 13. How do I get to the site's home page? 14. How could I get back here from the home page?
An example of the test online: http://www.indiana.edu/~audioweb/T284/trunk-test.html	An example of the test online: http://instone.org/navstress
(Krug, 2006)	(Instone, 2000)

Figure 5-7 Evaluation of navigation by Krug and Instone

Nevertheless, offered methodologies have some drawbacks. Thus, they reflect neither flexibility of the website nor contextual linkage between the content of the site. Furthermore, Instone even predicts that not many websites can actually pass his "stress test" (Kalbach, 2007). The latter I view as a main weakness of his approach, because not being able to point to an answer on a website does not mean that the site's architecture is poor. A good example is Instone's own website that actually cannot pass his own stress test. However, I think that if evaluator himself can predict that majority of websites cannot pass his test, it should be adjusted or revised.

Further, Keith Instone also explained a process how an evaluation process should be taken. Thus, it should be conducted on a **low-level** page printed out in **black and white**, without the URL listed in the header/footer. Moreover, the evaluator must pretend that he is **entering this site for the first time at this page** (Instone, 2000). These guidelines suggest that users can use different visual cues to find the information. By suggesting these guidelines for evaluation method, in my opinion, the author eliminates information flow from additional information cues and forces an evaluator to answer questions based solely on a navigation construct. I think that this is a very interesting approach for navigation evaluation, even though, it requires some preparation for conducting the test. So, it might be also used for non-professional evaluators.

Why is my method different?

The main difference with the approach that I suggest is that in Krug's and Instone's navigation tests users should answer posted questions. In my case, however, I offer to find an appropriate navigation type using the question and then evaluate it based on a heuristic rule.

I offer to use my heuristics, if evaluators should assess the product that is just delivered by IA specialist, one could say that they really see the website for the first time. Moreover, I think that if I use a screen version of the site for evaluation, evaluators would assess the website in context. Thus, the heuristics for different project will remain the same, whereas, the context and content of the site will be diverse. In my view, users use contextual cues when navigating the website because these cues support information scent on the website and they are a part of visual IA (see Figure 4-3). Besides, my method is different because I suggest evaluating outcomes using evaluation scales. Finally, I suggest introducing heuristics for evaluators in the form of a toolkit with explanations and examples, where evaluators could support their answers with comments.

Summing up

Navigation IA component is a complex tool that helps people to move around the website. It includes navigation bars, hyperlinks, buttons and clickable images and graphics. It helps to determine what content is available on the website and how to find a way around. From IA perspective web navigation is a systematic organization of links that provides access to information and makes meaningful associations (Kalbach, 2007, p. 22). Besides, navigation enhances understanding, reflects brand, and lends to overall credibility of a site (Kalbach, 2007, p. 3).

Thus, navigations systems are important components to review in evaluation that reflects information architecture because navigation supports browsing, provides access to information, indicates where and what can be found on the website.

To evaluate IA in navigation systems, I suggest assigning a question to every type of navigation system. I consider that these questions reflect user's thoughts when interacting with that navigation system. Answers to these questions should lead a user to a website navigation that should be evaluated by suggested heuristics. According to my hypothesis, this procedure should help to evaluate different types of navigation. Hence, answering heuristics should walk an evaluator through all navigation system components and, theoretically, should reveal to evaluators the strengths and weaknesses of navigation under the review. These methods would assist in checking a quality of IA of a navigation system.

However, the idea to use simple questions for a website navigation evaluation is not new. This evaluation method had already been tested and adopted by specialists. Therefore, I consider that using questions as a good starting point in suggesting evaluation for navigation as IA component.

Even though some questions that I offer in my heuristics are similar or even the same to those, which are already mentioned in existing methodologies, I have a different explanation to why they are included in heuristics. They are the same because we all attempt to evaluate navigation systems in website. Besides, in my heuristics, I include only questions that support evaluation of navigation as IA component. In addition, I take these questions further by supporting them with relevant IA theories that explain why the question is assigned to a particular navigation type.

Moreover, to target the evaluation for non-expert users, I suggest a common sense explanation of why these heuristics are important. Every time human beings are involved into something, they often question why (Eysenck & Keane, 2010). They would like to know the logic behind the process, reasoning, and

arguments (Eysenck & Keane, 2010). Therefore, each set of questions that evaluate one navigation type, I support with a common sense explanation that highlights reasoning behind the importance of suggested questions.

Chosen approach is good because it is quick and inexpensive to conduct. Moreover, it does not require expert opinions. However, by reviewing the entire site, an owner will get a "big picture" on potential navigation problems. Results of such evaluation can be rather subjective and require a specialist to suggest how to improve the site. This method is rather subjective because it relies on the evaluator's judgments as to the compliance with suggested principles.

Heuristics for evaluation of navigation systems

Based on introduced earlier theoretical foundation for navigation, in this subchapter I formulate one or several evaluation principles to each type of navigation suggested by Kalbach. Each subchapter starts with one or several heuristic rules that are followed by a short explanation. To visualize my attempt to connect questions, theories, concepts into heuristics supported by explanations, I summarized the outcomes in a graphical form.

Graphical representation of results

To make my attempt visual, I made several graphical representation for suggested heuristics. Thus, I have graphical elements that represent:

- Website navigation (see Figure 5-8).
- Structural navigation (see Figure 5-11).
- Associative navigation (see Figure 5-13).
- Utility navigation (see Figure 5-23).
- Contextual navigation (see Figure 5-20).
- Other navigation related to navigation issues (see Figure 5-29).

Each representation divides presented information into several sections:

- navigation type
- simple question that a user has in mind when interacting with a particular navigation type
- heuristic rules
- short explanation why the heuristics are/is there
- supporting arguments from experts

I presented my heuristics using this representation because it pinpoints the most important thoughts that I had formulating the heuristics. Moreover, such representation shows how to evaluate navigation in detail. Such representation does not show the hierarchical structure of navigation, e.g. in a figure that represents structural navigation (see Figure 5-11). In theoretical part, I explained that the structural navigation consists of global and local navigation types (see Figure 5-3). On a drawing, however, all navigation types are represented similarly. To illuminate this problem, I used different heading colors for navigation that lies upper in the higher hierarchy.

Website navigation

✓ **It is easy to see who the sender of information on the site is.**

✓ **The purpose of the site is clear.**

The first two heuristics are introductory heuristics that let a person look around in the system. They do not evaluate IA. Instead, they set a user into a mindset of this website. Website is a communication tool (Blundel, 2004, 2013). Therefore, these heuristics evaluate an ability of evaluator identifying the sender of information and the purpose that fulfills introduced communication tool.

Thus, by being able to find an answer to these heuristics rules, users clarify answers to the most basic questions that they get in mind when entering a new website: *Who is the sender of information? What is the purpose of this communication? What is the website about?* (Blundel, 2004, 2013) Providing answers to these questions add credibility to the website, support understanding whether this information is relevant. Rosenfeld supports, "Users should always know what site they are in, even if they bypass the front door and enter through a search engine or a link to a subsidiary page "(Rosenfeld et al., 2015, p. 180).

The explanation of these heuristics to a non-professional user should highlight that it is important to know who stands behind the website, what is its purpose. This understanding adds credibility to the resource and evokes trust to the site's content and organization that stands behind the content (Krug, 2006). Thus, for non-professionals in my explanation I would say that looking at a website is essential to be able to point *company's name, site name, brand, main topic, title of every page* because this information adds trustworthiness to the resource and evokes confidence in the site's content and organization that stands behind the content (see Figure 5-8).

Heuristics for evaluation for website navigation in general
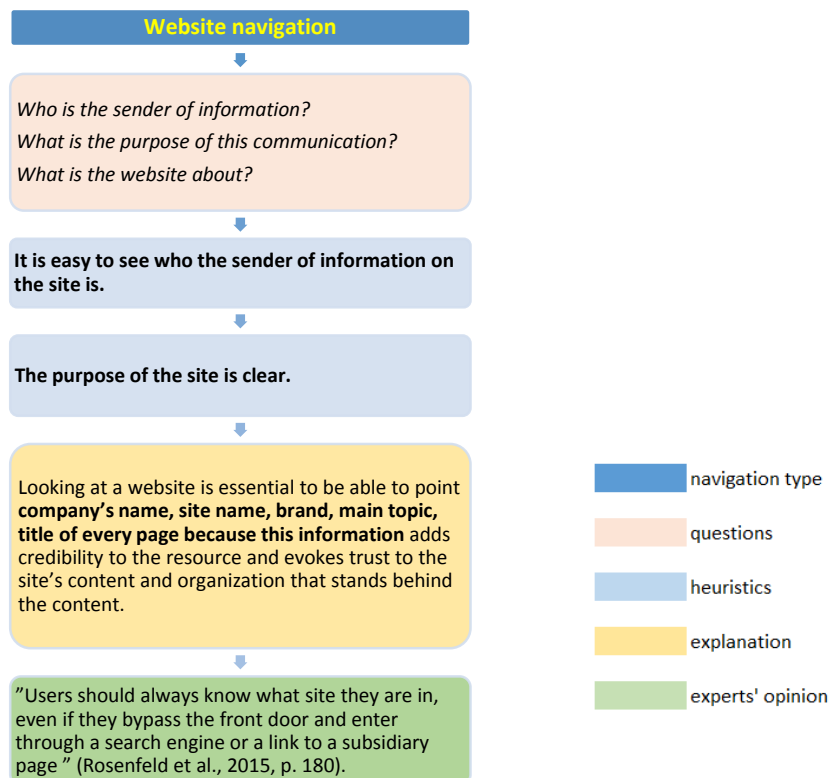
Figure 5-8 Website navigation

Structural navigation

- ✓ **It is easy to point out where I am on this site, where I can go further, and where is an exit point.**
- ✓ **There is a clearly identified link to the Home page.**
- ✓ **There is a clear indication of current location.**

In general, navigation is all about orientation on the website (Kalbach, 2007). Therefore, heuristics on the next card are there to answer other fundamental questions that a site visitor gets when he enters the site: *Where am I on this site? Where can I go from here?* (Kalbach, 2007, p. 10).

In other words, this heuristics force to evaluate a system navigation as one complete system. Rosenfeld supports, this type of navigation should "provide the context within the greater whole" (Rosenfeld et al., 2015, p. 180). Moreover, knowing where you are on a site supports information scent and users know whether they are on the right track or not. Rosenfeld supports, ""You are here" indicator can be the difference between knowing where you stand and feeling completely lost" (Rosenfeld et al., 2015, p. 180). Rosenfeld explains, "you should always follow the rules of thumb to ensure that your design provides contextual cues (Rosenfeld et al., 2015, p. 180). Furthermore, "knowing how deep you are in a site can give cues as to granularity and detail of information encountered" (Kalbach, 2007, p. 11) Rosenfeld supports, "users should always know what site they are in, even if they bypass the front door and enter through a search engine or a link to a subsidiary page" (Rosenfeld et al., 2015, p. 180). Rosenfeld et al. explain, "you should always follow the rules of thumb to ensure that your design provides contextual cues" (Rosenfeld et al., 2015, p. 180).

Thus, a good navigation gives its users a sense of location, sense of direction, sense of scale and does not distract from the main task. Morville et al. state, "most global navigation bars provide link to a home page…, some provide contextual cues to identify user's current location" (Morville, 2006, p. 122). Therefore, in all websites there should be a clear path to the main page. Rosenfeld supports, knowing current location "helps when users get interrupted while navigating and reminds visitors where they are in a site" (Kalbach, 2007, p. 87). Thus, a clear indication of current location is also important. To sum up, structural navigation helps visitors to narrow into a content of a website. To do it, I identified three main features that must be present on all websites. These features are reflected in suggested heuristics.

To explain the relevancy of these heuristics to non-experts, I offer to let the evaluator imagine a situation where a visitor entered the information system through pages other than the landing page. Moreover, explain to evaluator that such a situation is rather common if a system is accessed through a search engine. Furthermore, I need to focus the evaluator's attention on a fact that even though visitors landed on other pages of a system, they still need to be able to understand at a glance how to navigate the website, where they can go, and what kind of information it contains (see Figure 5-11).

To exemplify global navigation on a toolkit I will use several screenshots that represent global and local navigation, contain answers to all questions (see Figure 5-10)

Figure 5-10 IKEA corporate website (IKEA, 2016)

Global navigation
- ✓ **All major topics of the site are visible and accessible from the Home page.**
- ✓ **Navigation appears on all website's pages.**
- ✓ **Navigation behaves consistently and predictably. For instance, it has pressed, hovered and visited state.**

The next three heuristics are there to evaluate a global navigation. In general, global navigation provides a broad overview of what is there on the site, defines boundaries of the site. It includes only the most valuable items, offers information in broad and mutually exclusive categories. It allows access to main areas and functions on the website. Hence, it creates an idea what is the subject matter on this site and sets expectations of users to the content of the site (Kalbach, 2007). Moreover, it helps users to orient on the page and, thus, stays unchanged on all website pages. Kalbach supports, "it is comforting to have a persistent navigation mechanism across the site" (Kalbach, 2007, p. 87). In addition, "it tells you what the site is all about and what you should use it for" (Wodtke & Govella, 2009, p. 193).

Beyond this, the main page adds to "understanding its relationship to other pages" because it "helps set context along with page titles and other elements" (Kalbach, 2007, p. 10). Thus, all web pages should include the name of the organization and "the navigation system should also present as much as possible of the structure of the information hierarchy in a clear and consistent manner, and indicate the user's current location" (Rosenfeld et al., 2015, p. 180). Moreover, it gives an overview of topics that are covered on the site and behaves consistently when user interacts with the menu. Kalbach supports, "users don't expect to land somewhere complete unrelated when using main navigation" (Kalbach, 2007, p. 87). Furthermore, modern users expect navigation to behave in a certain way and show different cues during interaction. For instance, it has pressed, hovered and visited state, etc. Unexpected navigation behavior affects credibility (Kalbach, 2007). This will result in a situation where a user leaves a website. These are, in my opinion, the most basic requirements to a global navigation on the site that are true for most websites and, therefore, must be reflected in the heuristics.

Based on introduced theoretical points about function of global navigation on websites and a question suggestion for global navigation suggested by Rosenfeld et.al. (see Figure 5-4), I suggest the following questions that characterize the global navigation on websites: "*What are the major sections of this site? What does the navigation provide access to? What page am I on? What is there on the site?*"

Suggested heuristics for evaluation of global navigation reflect on navigation's accessibility, appearance and behavior.

To support these heuristics with explanations that would be understandable for a non-professional evaluator, however, I would explain these theoretical implications by using well-known facts from cognitive psychology. Thus, "cognitive psychology rests on the premise that human information-processing capacity is rather severely bounded" (Hardman & Macchi, 2003, p. 213). In other words, "cognitive psychology is concerned with internal processes, mental limitations, and the way in which the processes are shaped by the limitations"(Kahneman, et al, 1982, p. xii). According to Cowan, "one of the central contributions of cognitive psychology has been to explore limitations in the human capacity to store and process information" (Cowan, 2010, p. 2). The list of documented limitations includes the classic thesis that the capacity of short-term memory is restricted to a limited number of chunks of information—"the magical number seven, plus or minus two" (Miller, 1956). Similarly, "the ability to pursue multiple intentional goals at any one time (for example, driving a car, planning one's day at work and, simultaneously, listening to the latest scoop on the

stock market) is thought to be restricted by a limited budget of strategic processing capacity" (Hardman & Macchi, 2003, p. 213).

Due to these cognitive limitations, that now become a classic and well-known thesis, I offer to base my explanation targeted to non-expert evaluators on them. In the explanation, I offer to check whether the global navigation contains only essential items that cover appropriate breadth and depth in a topic that is introduced in your information system to your target audience. The explanation to these heuristics underlines the importance that navigation is precise, concise and consistent (see Figure 5-11).

Local navigation
✓ **Related information is linked together under a relevant category.**

This heuristic evaluates local navigation in a system. Generally speaking, local navigation is used to "access lower levels in a structure, below the main navigation pages" (Kalbach, 2007, p. 89). As a rule, this navigation supports global navigation. Local navigation often represents related topics that are gathered together under a relevant category. Morville supports, local navigations "enable users to explore immediate area" (Rosenfeld et al., 2015, p. 186). In other words, this navigation reveals the depth of the subject introduced on the site. Kalbach supports, "local navigation provides a great deal of context… It plays a key role indicating "aboutness of the site. It also gives a sense of granularity of the content" (Kalbach, 2007, p. 90).

When users interact with local navigations, they usually ask themselves the following questions: *Where can I go from here? What is this site about? What are other options within a given category?* (Kalbach, 2007, p. 10). Accordingly, local navigation comes into play when users know that they need some information about a certain topic, but they are not sure what they really need. Hence, after choosing a global navigation link, they get to local navigation that helps users browse to information that is more specific until they find what they look for. In other words, local navigation provides a list of related topics that might be important for users who do not know what they need to know. Thus, it supports exploratory seeking task (Wodtke & Govella, 2009).

I have chosen to evaluate local navigation with one heuristic rule because local navigation is highly dependent on global navigation, and site's context. It may include various types of links. For instance, links to similar pages, links to documents, links to other types of content format, etc. Therefore, it is difficult to come up with a couple of heuristics that would fit all websites.

Nevertheless, I consider that it is important to evaluate how well parent name describes the content of its children. Besides, children elements should provide related information to that information that parent potentially must cover. This idea is reflected in a suggested heuristic for the evaluation of local navigation.

For non-experts these theoretical implications I summarize into a statement that explains that local navigations must reveal website's content and support information scent on the site. Thus, for non-experts, this heuristic I would explain by mentioning that the navigation must indicate "aboutness" of the site. Navigation must show enough information for people to understand what they will find, if they dig deeper into the website, what they can do in the website (see Figure 5-11).

Heuristics for evaluation of structural navigation systems

Structural navigation

Where am I on this site?
Where can I go from here?

It is easy to point out where I am on this site, where I can go further, and where is an exit point.

There is a clearly identified link to the Home page

There is a clear indication of current location

Imagine a situation where a visitor entered your information system through pages other than the landing page. Even though visitors landed on other pages of a system; they still need to be able to understand at a glance how to navigate the website, where they can go, and what kind of information it contains.

"Knowing how deep you are in a site can give cues as to granularity and detail of information encountered" (Kalbach, 2007, p. 11).

"Provide the context within the greater whole" (Rosenfeld et al., 2015, p. 180).

""You are here" indicator can be the difference between knowing where you stand and feeling completely lost" (Rosenfeld et al., 2015, p. 180).

You should always follow the rules of thumb to ensure that your design provides contextual cues (Rosenfeld et al., 2015, p. 180).

"Users should always know what site they are in, even if they bypass the front door and enter through a search engine or a link to a subsidiary page" (Rosenfeld et al., 2015, p. 180).

Global navigation

What are the major sections of this site?

What does the navigation provide access to?

What page am I on?

What is there on the site?

All major topics of the site are visible and accessible from the Home page

Navigation appears on all website's pages.

Navigation behaves consistently and predictably. For instance, it has pressed, hovered and visited state.

Human mind has cognitive limits. Therefore, navigation must contain only essential items that cover appropriate breadth and depth in a topic that is introduced in your information system to your target audience.

GN creates an idea what is the subject of matter on this site and sets expectations of users to content of the site (Kalbach, 2007).

"it is comforting to have a persistent navigation mechanism across the site" (Kalbach, 2007, p. 87).

"it tells you what the site is all about and what you should use it for" (Wodtke & Govella, 2009, p. 193).

GN adds to "understanding its relationship to other pages" because it "helps set context along with page titles and other elements" (Kalbach, 2007, p. 10).

it "should also present as much as possible of the structure of the information hierarchy in a clear and consistent manner, and indicate the user's current location" (Rosenfeld et al., 2015, p. 180).

"users don't expect to land somewhere completely unrelated when using main navigation" (Kalbach, 2007, p. 87).

Unexpected navigation behavior affects credibility (Kalbach, 2007).

Local navigation

Where can I go from here?

What is this site about?

What are other options within a given category?

Related information is linked together under a relevant category.

Navigation must indicate "aboutness" of the site.

Navigation must show enough information for people to understand what they will find, if they dig deeper into the website, what they can do in the website.

this navigation provides "access lower levels in a structure, below the main navigation pages" (Kalbach, 2007, p. 89).

it "enables users to explore immediate area" (Rosenfeld et al., 2015, p. 186).

it "provides a great deal of context… It plays a key role indicating "aboutness" of the site. It also gives a sense of granularity of the content" (Kalbach, 2007, p. 90).

it supports exploratory seeking task (Wodtke & Govella, 2009).

Legend:
- navigation type
- questions
- heuristics
- explanation
- experts' opinion

Figure 5-11 Structural navigation

Associative navigation

✓ **The page provides access points to more relevant, more detailed or related information that come in handy when a user reads about the topic of interest.**

This heuristic should contribute to a general assessment of associative navigation. "Associative navigation makes important connections across levels of hierarchy or site structure" (Kalbach, 2007, p. 91). In other words, it provides access to other topics that are relevant to the information that the visitor is currently looking through. Thus, it connects one page with other pages that hold similar content. Wodtke also points that "associative navigation is particularly good for exploratory seeking and helps users uncover what they "don't know" but should" (Wodtke & Govella, 2009, p. 191). Finally, associative navigation is a tool that adds information scent to the website (Kalbach, 2007).

When the user interacts with this type of navigation, he usually asks himself the following questions: "*What are other relevant topics?", "Is there anything else that I do not know but should?"* (Kalbach, 2007; Wodtke & Govella, 2009).

In my opinion, it is important to evaluate associative navigation because it addresses two important situations that users will eventually face interacting with every page on your website. Firstly, what happens after the user has been effectively interacting with the website? Secondly, what happens if the information provided on the site is not what a user needs? Associative navigation is there to answer these two questions by providing links to more relevant information within the page. In other words, it attempts to make a user stay on your website longer. This idea is underlying in offered heuristic.

To sum up, through associative navigation websites provide different ways to access other relevant, more detailed or related information. According to Kalbach associative navigation can be represented on a site by contextual navigation, quick links, footer navigation (see Figure 5-3). However, large information environments (e.g. IKEA, Amazon, etc.) often use a combination of all three types of access points. Thus, modern websites tend to be very complex due to a large amount of information they offer. Therefore, smaller websites tend to use at least one type of associative navigation (e.g. footer or quick links). Therefore, writing a postulate for each navigation type might be irrelevant for all websites. I my thesis, I aim to make a universal tool for website evaluation. Therefore, I will include only one general heuristic rule for evaluation of associative navigation (Figure 5-13).

An explanation of this heuristic to evaluator makes to the evaluator understand why associative navigation is important on the site. I base my explanation on a theory of information scent (Spool et al., 2004). In the toolkit explanations will also be supported by some relevant examples (see Figure 5-12).

Figure 5-12 Aalborg University (AAU, 2016a)

Heuristics for evaluation of associative navigation systems
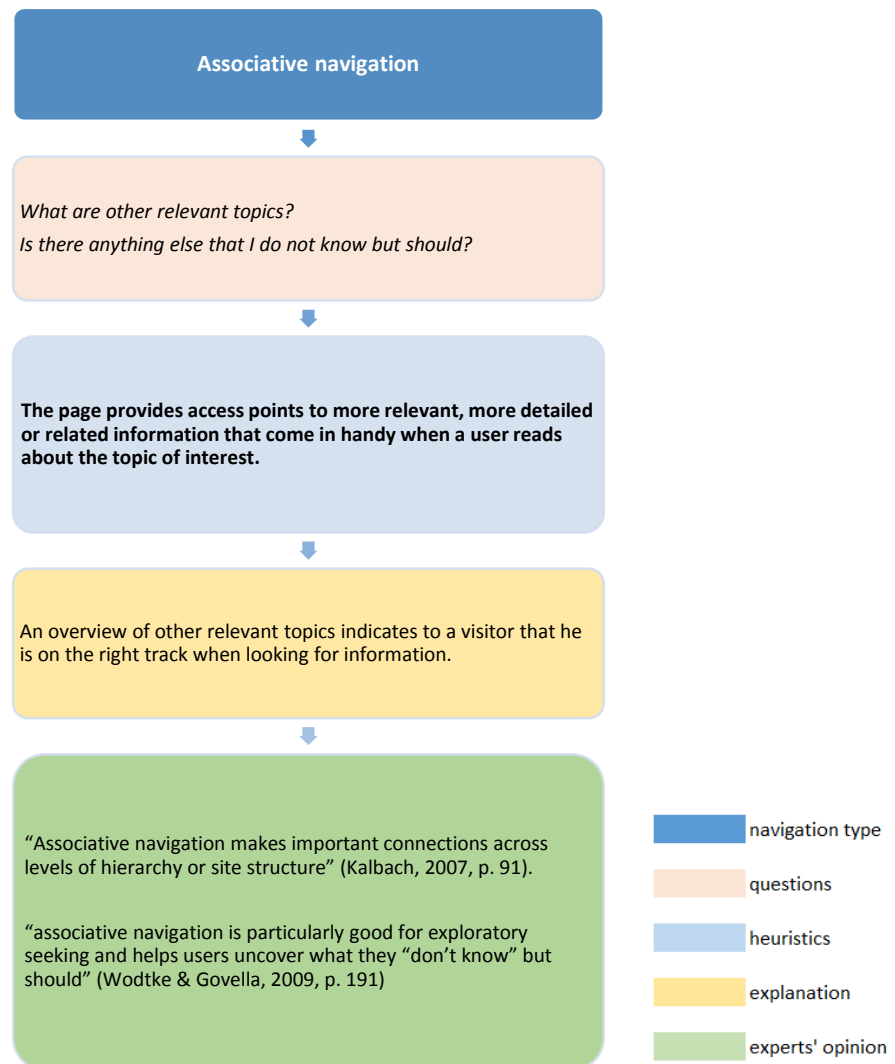
Figure 5-13 Associative navigation

- ✓ **There are smaller chunks of assess points that lead visitors to a new information inside/outside the site.**
- ✓ **The text contains links that provide cross reference to other topics within the text.**
- ✓ **Embedded links should be precise and to the point to help readers grasp their meaning without having to read the surrounding text.**

These heuristics evaluate contextual navigation. Contextual navigation is a situational navigation that leads to similar pages at the same level within the site that lead to new, but related content areas that can be located internally or externally (Kalbach, 2007, p. 92). "Contextual navigation supports exploration and may point people to new information" (Kalbach, 2007, p. 93). Kalbach divides contextual navigation into embedded navigation and related links (see Figure 5-3). Contextual navigation is used "to suggest related topics and content in other areas of the site" (Farnum, 2002, p. 38).

Based on theoretical explanations, I might say that coming across this navigation type a visitor asks the following questions: "*Is there any other related topics/content on this site?*" "*Can this website point to a new useful and related information outside the site*?" (Rosenfeld et al., 2015).

Embedded navigation that is often represented as plain text links, provides cross reference to other topics within the text. Some authors criticize this approach by arguing that users end up bounding from page to page without completing to read the whole message (Jarett & Quesenbery, 2010). However, some authors suggest that embedded links (contextual navigation) if used in the middle of a sentence can disrupt the reader's processing of overall sentence syntax (Spyridakis, 2000, p. 370). Lynch suggests that embedded into the text links can foster a lack of attention, "creating casual, easily distracted `surfers' instead of committed, engaged readers" (Lynch & Horton, 1997, p. 115). Moreover, to "follow the path of embedded links, readers must have sufficient background knowledge (their own prior knowledge or knowledge supplied by the site designer) to understand the linked page on arrival" (Spyridakis, 2000, p. 370). Lynch and Horton support, "following associative links can be the Web's equivalent of traveling without an itinerary" (Lynch & Horton, 1997, p. 116). Lynch and Horton also note that embedded links may slow down readers who are scanning the content because they will need to stop and read texts surrounding the embedded link (Lynch & Horton, 1997). Spyridakis, however, suggests to "place embedded links in the sentence closer to the end of the sentence where they will least disrupt the syntax of the sentence" (Spyridakis, 2000, p. 370). In addition, embedded links should be precise and to the point to help readers grasp their meaning without having to read surrounding text. Other authors argue that readers skip reading the text and follow links because they are looking for right information and are not finding it. Thus, embedding more links in your content provides a wayfinding technique to help users to locate information (Baker, 2012).

I consider that often contextual links are redundant and if overused can confuse a user. However, for some type of websites they can be handy because they provide links to information in context. These websites include cross references directly in a text paragraph and readers have all the page content as context for the link (Johnson, 2012). Some modern sites effectively use this type navigation to provide information in context. Johnson supports, "the abundant context for inline or contextual links makes these links such a good technique for wayfinding" (Johnson, 2012). Kalbach supports "from a business standpoint, contextual navigation provides opportunities for upsell" (Kalbach, 2007, p. 93). For instance, product pages in e- commerce sites often have links to related products and services.

Related links serve the same purposes as embedded links. However, on the page they are represented as a set of links that can forward readers to related items. For instance related articles or today's news, link to most viewed items, etc.

Having these theories in mind, in a heuristic evaluation I address these two types of links with several heuristics. The first heuristic rule helps to evaluate whether the website navigation supports exploration of website's content and relevant materials outside the website, points a reader to a new relevant information. The second heuristic evaluates whether the readers can get to another related article or piece of content. This heuristic, in my opinion, is especially relevant for a modern scroll-websites because it allows moving prom one piece of content to another without a tedious scrolling. The last heuristic evaluates whether the navigation communicates the content of the article that lies beneath it. In other words, labeling in contextual navigation is highly content and context dependent, and, therefore, it is critical to name the content appropriately so a reader has a good sense what is hidden beneath these links.

For the evaluators, though, I explain that this navigation creates a strong connection between the text and linked documents, articles, related pages. Contextual navigation also adds to information scent on the website (see Figure 5-20).

In the toolkit contextual navigation will be supported with several examples that represent all types of contextual navigation (see Figure 5-14).

Figure 5-14 Aalborg University Library (AAU, 2016b).

Quick links
- ✓ **There is a chunk of navigation that gives an extra entry point to frequently accessed content areas on the site.**
- ✓ **There is a chunk of navigation that highlights the key areas that are highly important, but are not presented in a top-level navigation.**

These heuristics evaluate quick links on a website. Quick links give access to important content or areas on the site that are not represented in a global navigation. Quick links are contextual to entire site and often highlight frequently accessed areas on the site, promote areas deeper in the site (Kalbach, 2007, p. 93).

Thus, quick lists are important because they offer direct access to deeper sections of the site. They are often task based. For instance, Popular Resources, Key links, Essential links, etc. This depends on who are your target audiences, and what is the purpose of those links. Quick links may have different labels, and content.

They come in handy when a user returns to your website and is looking for access to a definite piece of information. For instance, access point to his account in a system or a useful document, etc. Thus, reaching this type of navigation user usually asks himself: *"Is there a direct access to the information on this site that I frequently visit?"* (Kalbach, 2007, p. 93).

Thus, the information that quick links point to will vary from website to website. However, the idea that a set of links are pointing to frequently accessed areas on a site is widely used on different types of websites and, therefore, is incorporated in my first heuristic. The second heuristic focuses on providing readers with an ability to rapidly scan all available options that the website offers.

On the card for evaluation, bridging these theoretical implications to a common sense knowledge, I suggest the evaluator to focus on providing content access spots to returning users.

In my explanation of these heuristics rules to evaluators, I explain that returning users, as a rule, are important for website owners. However, they have been on this website before. Consequently, they know what information they are looking for. Therefore, they have a different seeking pattern than those who visit the site for the first time. And, thus, they need a different website experience. Returning users determine the most frequently accessed content categories. Therefore, to make a pleasing website experience for these users, placing access points to a frequently accessed content into landing pages can sufficiently improve a navigation. Besides, highlighting and providing access points of the most important content areas that are not presented in a main navigation would also serve the same purpose (see Figure 5-20).

Adaptive navigation

✓ **A website makes recommendations based on information about related searchers from other users.**

This heuristic evaluates adaptive navigation on a website. Adaptive navigation is a navigation that has a dynamic nature and provides links, which are generally based on other similar interactions on the same website. It is used to make recommendations on information that can be potentially interesting to a visitor (Kalbach, 2007). Suggestion is based either on related searchers from other users or on ranking the information. Thus, adaptive navigation dynamically builds a model of goals, preferences and knowledge of the individual user based on links that he visits and uses this information throughout the whole interaction process for adaptation to the needs of that user. When the user meets this type of navigation, he often thinks: *"Can a website suggest similar products or services?", "Can a website point to the most popular item?", "What do other people who bought this item bought?"* (Kalbach, 2007).

The use of adaptive navigation on the site is one of the ways of increasing its functionality. As a rule, it is used only on bigger websites. However, I included it into my heuristics because the evaluation rule targets user-oriented model of a website because it is based on personalization and storytelling principles. This feature is not common in a small corporate website. Therefore, some evaluators will experience that they miss this function. However, by including this heuristic I think that there is a chance to exemplify to the owner of the website that "one size fits all" is a bad concept in web design.

Therefore, for a non-professional evaluator I would explain that this feature is often used on a bigger commercial websites. So, to boost sales such website often recommend similar products or services that can be potentially interesting for a client (e.g. Booking.com, Amazon, etc.). It supports personalized access to

information by suggesting products, services or information to users based on their behavior on a website. For instance, "customers who bought this also bought" on Amazon website.

This feature is often used on a bigger commercial websites to boost sales. It is used to personalize the content by recommending similar products or services that can be potentially interesting for a client. For instance, "customers who bought this also bought" on Amazon website (see Figure 5-20).

Footer navigation

- ✓ **There is an area at the bottom of the page that indicates a dead-end of the site.**
- ✓ **There is an area at the bottom of every page of the site that contains a cluster of supplementary information that is not pertinent to the main topic of the site.**

This heuristic evaluates footer component on a website. Generally speaking, footer navigation contains supplementary information not pertinent to the main topic of the site that does not address to specific user need, but address the legal requirement of site owners (Kalbach, 2007, p. 93). When the visitor finally reaches a footer navigation, he usually has the following questions in his mind: *"Is there an end of this site?", "is there any important supplementary information to website's content?"*(Kalbach, 2007, p. 93).

I included a heuristic for evaluation of the footer because I consider it to be an important area of the site for two reasons. Firstly, it displays supplementary technical information for the user based on purposes of the website, content, user needs. Secondly, the footer is a good way to indicate that the website is over; there is no more content beneath the footer.

I think it is particularly important to add this heuristic to my evaluation because many of single page websites, that became highly popular for the last few years, omit this important component. For instance, highly rated (see Figure 5-15) by web design community one page website Holm Marcher web design agency have completely ignored footer on their corporate website (see Figure 5-16).
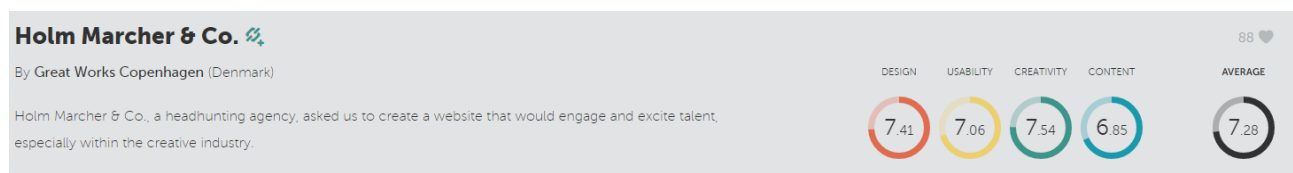
Figure 5-15 Rating of this website by Awwwards (http://www.awwwards.com/sites/holm-marcher-co) (Awwwards, 2015)

Figure 5-16 Footer of Holm Marcher (at http://holmmarcher.dk/da/)

As a user, I am often unsure whether I have reached the end of the website or the site is just slow. Moreover, as a user of such site, I do not know what comes next. I have a feeling that I do not control interactions with such a page. In addition, I do expect to reach an end signifier at the end of the site. Besides, these kinds of websites are often highly rated by people interested in web design and development. For instance, "I fly website" by KLM (see Figure 5-17).
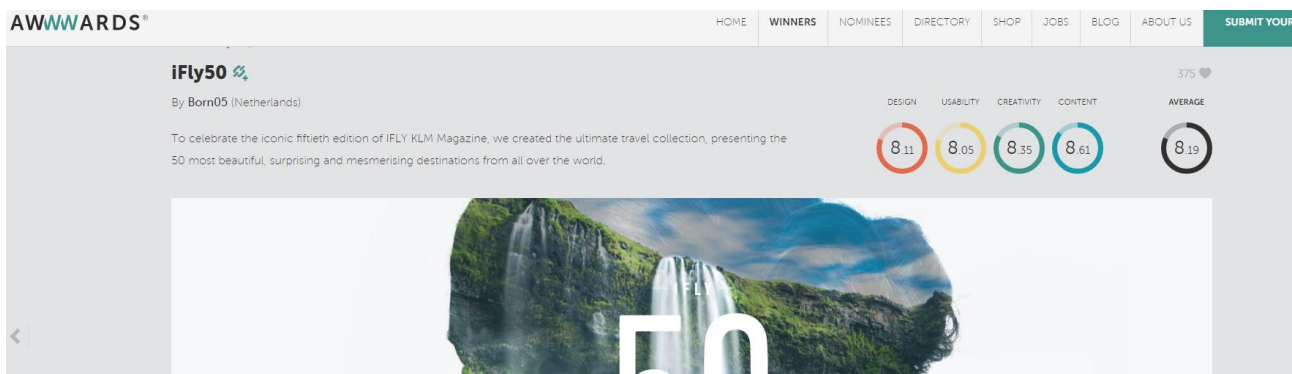
Figure 5-17 "I fly" by KLM (https://www.ifly50.com/en_dk/50) (Awwwards, 2015)

In spite of that, I consider that mentioning footer navigation in the evaluation is rather important because, according to theories, footer navigation has its unique functions and purposes. Hence, after conducting the evaluation website owners would be able to question a website design without such an important element as the footer and even demand to include it on the site, if for some reason it was not included by the web developer. Finally, I must admit that even modern parallax and one page webpages can benefit from using the footer. For instance, Aarhus Handelsgymnasium, and Spring/Sommer.
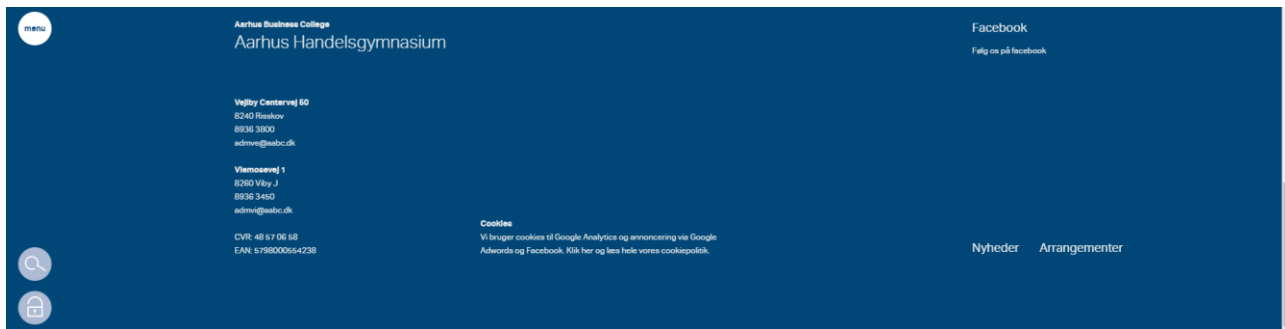
Figure 5-18 Aarhus-handelsgymnasium (Aarhus-handelsgymnasium, 2016).

Figure 5-19 Spring/Summer (Spring/Summer, 2016).

Therefore, for a non-expert evaluator, I would support my heuristic with a brief explanation of why the footer is there, why it is important, what customers' expect to read in the footer. Furthermore, I support my explanation with examples what kind of information the footer can contain (see Figure 5-20).

Heuristics for evaluation of contextual navigation system

Contextual navigation

Is there any other related topics/content on this site?

Can this website point to a new useful and related information outside the site?

There are smaller chunks of assess points that lead visitors to a new information inside/outside the site.

The text contains links that provide cross reference to other topics within the text.

Embedded links should be precise and to the point to help readers grasp their meaning without having to read the surrounding text.

Links in a website text and links to other relevant topics create a strong connection between the text and linked documents, articles, related pages and indicate topics indicates to a visitor that he is on the right track when looking for information.

Contextual navigation is a situational navigation that leads to similar pages at the same level within the site that lead to new, but related content areas that can be located internally or externally (Kalbach, 2007, p. 92).

"Contextual navigation supports exploration and may point people to new information" (Kalbach, 2007, p. 93).

Kalbach divides contextual navigation into embedded navigation and related links(Kalbach, 2007).

Contextual navigation is used "to suggest related topics and content in other areas of the site" (Farnum, 2002, p. 38).

Quick links

Is there a direct access to the information on this site that I frequently visit?

There is a chunk of navigation that gives an extra entry point to frequently accessed content areas on the site.

There is a chunk of navigation that highlights the key areas that are highly important, but are not presented in a top-level navigation.

Returning users are important target audience for website owners. These people have been on this website before. Consequently, they know what information they are looking for. Therefore, they would be pleased if a main page would have access points to a frequently accessed content on your site.

Quick links give access to important content or areas on the site that are not represented in a global navigation (Kalbach, 2007)

Quick links are contextual to entire site and often highlight frequently accessed areas on the site, promote areas deeper in the site (Kalbach, 2007, p. 93).

Adaptive navigation

Can a website suggest similar products or services?

Can a website point to the most popular item?

What do other people who bought this item bought?

A website makes recommendations based on information about related searchers from other users.

This feature is often used on a bigger commercial websites to boost sales. It is used to personalize the content by recommending similar products or services that can be potentially interesting for a client. For instance, "customers who bought this also bought" on Amazon website.

Adaptive navigation is a navigation that has a dynamic nature and provides links, which are generally based on other similar interactions on the same website (Kalbach, 2007).

It is used to make recommendations on information that can be potentially interesting to a visitor (Kalbach, 2007).

Footer navigation

Is there an end of this site?

Are there any important supplementary information to website's content?"

There is an area at the bottom of the page that indicates a dead-end of the site.

There is an area at the bottom of every page of the site that contains a cluster of supplementary information that is not pertinent to the main topic of the site.

Many users expect to find certain items at the bottom of the site. The information from this section gives users the opportunity to discover important information on your site, provide the first impression, and indicate the end of the site. For instance, the section at the bottom line of the page could provide supplementary information regarding:

→copyrights information
→contact information
→site map
→legal disclaimers
→website feedback links
→terms and conditions
→site credits
→link to social media, etc.

Footer navigation contains supplementary information not pertinent to the main topic of the site that does not address to specific user need, but address the legal requirement of site owners. (Kalbach, 2007, p. 93).

Legend:
- navigation type
- questions
- heuristics
- explanation
- experts' opinion

Figure 5-20 Contextual navigation

Utility navigation

✓ **There are tools and features that are grouped on either the top, sides or bottom of the page and assist visitors in using this site.**

✓ **You can use a logo as a path to the main page.**

These heuristics evaluate utility navigation. Generally, utility navigation connects tools and features that assist visitors in using this site" (Kalbach, 2007, p. 93). Often "utility navigation is placed adjacent to the global navigation, because it also needs to be accessible everywhere on the site" (Wodtke & Govella, 2009, p. 210). When a user reaches this type of navigation he has already decided to make an action and now asks himself "*Where is a tool that could help me?"* (Kalbach, 2007, p. 93).

It is important to evaluate because it consists of common and/or important tasks that are ignored by a global navigation. Thus, utility navigation is usually not part of the main topic of the site. Instead, it assists visitors using the site, leads to important functions, varying page types. For instance, logging in/out, access shopping cart, help pages, etc. (Kalbach, 2007, p. 93). Moreover, it can contain other important links that are not "handled well by other navigation types" (Wodtke & Govella, 2009, p. 29). Often these features are important and necessary. However, they are often the last to be considered by the visitor (Wodtke & Govella, 2009). Based on these assumptions, the first heuristic for utility evaluation is formulated.

As a rule, utility navigation links vary from site to site depending on websites purpose and content. Therefore, I would omit heuristics that evaluate such utility navigation options as language selectors, region selectors, toolboxes, etc. Instead, in a first heuristic I try to state where the evaluator might find items that belong to utility navigation and what this navigation supposed to do. I do it because I seek to avoid confusion with other navigation types. Yet, there is one utility navigation option that should be common for all websites because many users are accustomed to it and consider that this behavior is standard for all websites (Kalbach, 2007). That is the logo linked to the main page of the website. Therefore, this issue is addressed in the second offered heuristic.

In the explanation for non-expert evaluator, I would explain that supporting optimal performance on the site is more important than making more desirable design pages. Utility navigation, thus, is useful because it shapes the way in which users interact with suggested system. This navigation is important for people in certain circumstances for instance, if customers would like to login/sign up to the system, see a shopping cart, follow a company on Facebook, share a page with someone, subscribe to news email, or switch to another language. Therefore, this navigation type has usually less prominent visual placement. However, it is placed the way that users can easily find them, if necessary. Moreover, the elements of this navigation include items that, at his point, website users consider to be standard, e.g. logo should lead to home page (Kalbach, 2007; Rosenfeld et al., 2015b) (see Figure 5-23).

Internal page navigation

✓ **If a website's content is too long, there should be a button that allows jumping from one piece of content to another, and back.**

This heuristic rule evaluates internal page navigation.

As mentioned earlier, last few years single page websites became trendy and popular (Rosenfeld et al., 2015a). On such websites, all content is incorporated into one page. To get around on such websites, users must either scroll the page or press a link that moves a user to a required page. Sometimes, such websites have a link that allows jumping back to the preceding piece of content. This, in my opinion, is more convenient and less confusing that scrolling back. Thus, if the website content is too long it is advantageous to add the

link that allows jumping from one page to another, providing a more efficient way to reach sections on a web and a reciprocal link back to the top (Kalbach, 2007, p. 93). When a user is looking for this tool, he usually has this question in mind: *"Is there more efficient way to reach a certain point on this site?"* (Kalbach, 2007).

Thus, I included a heuristic that is applicable mainly to websites with long content pages. Suggested heuristic gives an evaluator a hint that it would be advantageous to add a link that would allow users to get to the content they need without scrolling. This would make the webpage consistent and user-friendly (Kalbach, 2007).

The common sense explanation that supports this heuristic explains why it is important to add internal navigation to a longer webpages and answers to a question how to make navigation between sections on longer pages more efficient, accessible and usable (see Figure 5-23).

Explanation will be supported with examples from different websites, e.g. from IKEA website, AAU library website, etc. (see Figure 5-21; Figure 5-22).

Figure 5-21 IKEA internal Navigation (IKEA, 2016)

Figure 5-22 AAU library internal navigation (AAU, 2016b).

Heuristics for evaluation of utility navigation systems

Utility navigation

Where is a tool that could help me?

There are tools and features that are grouped on either the top, sides or bottom of the page and assist visitors in using this site.

You can use a logo as a path to the main page.

Website's optimal performance should be more desirable then a catchy design. Thus, users consider to be standard that some elements function in a certain way, e.g. website's logo should bring visitors back to main page. Other navigation options are important to users in certain circumstances. Therefore, these navigation options are usually less prominent visual placement. However, it is placed the way that users can easily find them, if necessary. For instance:

→Login/Sign up
→Shopping cart
→Follow us
→Share
→Subscribe
→Follow
→Switch languages, etc.

Utility navigation connects tools and features that assist visitors in using this site" (Kalbach, 2007, p. 93).

"Utility navigation is placed adjacent to the global navigation, because it also needs to be accessible everywhere on the site" (Wodtke & Govella, 2009, p. 210).

Utility navigation is usually not part of the main topic of the site. Instead, it assists visitors using the site, leads to important functions, varying page types. For instance, logging in/out, access shopping cart, help pages, etc (Kalbach, 2007, p. 93).

Utility navigation can contain other important links that are not "handled well by other navigation types" (Wodtke & Govella, 2009, p. 29).

Figure 5-23 Utility navigation

Internal page navigation

Is there more efficient way to reach a certain point on this site?

If a website's content is too long, there should be a button that allows jumping from one piece of content to another, and back.

Too long web pages are annoying to scroll. To navigate between sections of such a site efficiently and increase user persistence there should be a navigation option that allows moving from one section to another.

if the website content is too long it is advantageous to add the link that allows jumping from one page to another, providing a more efficient way to reach sections on a web and a reciprocal link back to the top (Kalbach, 2007, p. 93).

navigation type
questions
heuristics
explanation
experts' opinion

Other navigation related issues

Browser functions

Heuristics that I suggested earlier evaluate different types of navigations. However, to give a solid evaluation, more issues must be taken into consideration. Internet is old enough for users to formulate navigation patterns (Rosenfeld et al., 2015). These patterns are based on built-in browser functions and should be taken into considerations in the evaluation.

✓ **Back button, Forward button, History, Bookmarks, Favorites browser functions are operable.**

These built-in browsers mechanisms are frequently used and allow navigating IE (Kalbach, 2007, p. 93). Research, analysis and testing revealed that users expect these features to work consistently (Rosenfeld et al., 2015, p. 179). In particular, users expect that "open URL allows direct access to the site's content, Back and Forward buttons provide a bidirectional backtracking capability, history menu allows access to pages visited in the past, bookmarks or Favorites enables users to save locations of specific pages for future reference" (Rosenfeld et al., 2015, p. 178). Thus, when a user uses a built-in website mechanism and it does not work, the user often wonders, "*Why does not this mechanism work? "*(Rosenfeld et al., 2015).

The explanation to this heuristic underlines that people use websites regularly and, therefore, they have some browsing habits that a good IA should support. Users expect that built-in mechanisms in browsers work the same way on all websites. Therefore, it is necessary to consider built-in mechanisms in browsers as a supporting navigation option and make sure that IE still works, if it is navigated by back button, forward button. Other built-in mechanisms in browsers to consider are: session history, browser history, bookmarking, page reloading, etc.

In the toolkit, heuristics and explanations will be supported by examples of mechanisms from different browser to support explanation of the heuristics (see Figure 5-24; Figure 5-25; Figure 5-26).

Figure 5-24 Chrome browser
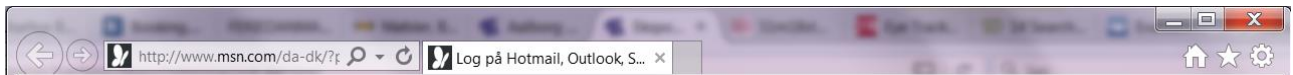
Figure 5-25 Internet Explorer browser

Figure 5-26 Firefox browser

Besides, users navigating the website use visual cues (Instone, 2000). Practice shows that they are also widely used in navigation process (Instone, 2000). Some methodologies offer to hide them during website navigation evaluation (Instone, 2000). However, I deliberately include them in my heuristics because they represent a visible part of IA and they are widely used in navigation processes.

- ✓ **Each page has a human-readable URL**
- ✓ **URL of the page reveals the structure of the site**
- ✓ **There are no broken navigation links**

In the card, however, I explain the presence of these heuristics from another perspective. Namely, search engines, ranking the website, also use human readable URLs and explore whether the site has some broken links. Therefore, improving URLs on the site should make it more search engine friendly.

Users often use different search engines to find the information they need. Often visitors choose to search for information in the website that received the highest rank from the search engine. It is necessary to optimize its links to make the site search engine friendly.
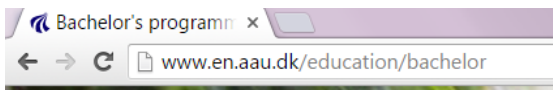
Figure 5-27 AAU web link (AAU, 2016a)
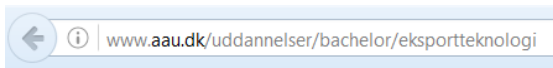
Figure 5-28 AAU web link (AAU, 2016a)

Suggested heuristic evaluates how the website behaves if navigated with built-in browsers mechanisms. It does not evaluate IA, but it lets the evaluator see that web designer made the site flexible and usable. Kalbach supports, "It is important to consider the environment in which the system will exist" (Kalbach, 2007, p. 93).

In the toolkit the heuristics will be supported by examples, e.g. AAU links (see Figure 5-27; Figure 5-28).

Heuristics for evaluation of other related to navigation system issues

Browser functions	Links &URLs

Browser functions

Why does not this mechanism work?

Back button, Forward button, History, Bookmarks, Favorites browser functions are operable.

Users expect that built-in mechanisms in browsers work the same way on all websites. Therefore, it is necessary to consider built-in mechanisms in browsers as a supporting navigation option and make sure that IE still works, if it is navigated by back button, forward button. Other built-in mechanisms in browsers to consider are: session history, browser history, URLs, bookmarking, page reloading, etc.

Built-in browsers mechanisms are frequently used and allow navigating IE (Kalbach, 2007, p. 93).

Research, analysis and testing revealed that users expect these features to work consistently (Rosenfeld et al., 2015, p. 179).

Users expect that "open URL allows direct access to the site's content, Back and Forward buttons provide a bidirectional backtracking capability, history menu allows access to pages visited in the past, bookmarks or Favorites enables users to save locations of specific pages for future reference" (Rosenfeld et al., 2015, p. 178).

Links &URLs

Is there more efficient way to reach a certain point on this site?

Each page has a human-readable URL

There are no broken navigation links

URL of the page reveals the structure of the site

Users often use different search engines to find information they need. Often visitors choose to search for information in the website that received the highest rank from the search engine. It is necessary to optimize its links to make the site search engine friendly.

There are other visual cues that visitors use navigating the site (Instone, 2000).

Practice shows that they are also widely used in navigation process (Instone, 2000).

Legend:
- navigation type
- questions
- heuristics
- explanation
- experts' opinion

Figure 5-29 Other issues in navigation

Summary on heuristics

In this chapter, firstly, I defined what a website navigation is. Moreover, I elaborated on different types of navigation and suggested two ways how IA experts categorize navigation items. Secondly, I introduced several approaches that are used to review solely website navigation. Thirdly, on the basis of theories and inspired by existing methods, I attempted to generalize theories and methods into a method that would help me to evaluate Navigation as IA component.

Finally, having the suggested method in mind, I generalized theories into heuristics for evaluation of navigation component of IA. Thus, I formulated one or several evaluation principles to each type of navigation suggested by Kalbach. Hence, each subchapter in this section starts with one or several heuristic rules that are followed by a short theoretical explanation, question that users have in mind interacting with the navigation and common sense explanation that I plan to include explaining the heuristics' relevancy to non-experts.

6. Conclusions and Prospective future work

In the introduction to this thesis, I presented a problem that I faced practicing IA. Specifically, I noticed that people who ask me to (re)design their website's IA are not entirely satisfied to hear in my presentation of their new websites what theories I have used in my research and why I developed the schemes the way I did. Looking at this problem closer, I found that the problem that I face is relevant both for stakeholders and for information architects. Therefore, the goal of this thesis was to suggest a way to evaluate a quality of IA construct on desktop version of websites that would be suitable for stakeholders.

To answer my problem statement, firstly, I reviewed commonly used website UEMs evaluations and concluded that none of them can be applied to answer my problem statement because in most of reviewed these methodologies, users were seen as reactive informers (subjects) and methodologies were primarily research oriented. Thus, in such methodologies researchers viewed users as a source of information that could provide insights on how to improve IEs. As an alternative, I was looking for methodology that provides insight for a design process. Nielsen's heuristic evaluation appeared to be the closest match to methodology that I needed (see Generalizations on the available methodologies). Therefore, I used them as an inspiration for a new methodology that can answer my problem statement (see What inspires me at Nielsen's heuristics?; What is missing from the heuristic evaluation approach?). However, it was targeted on expert evaluators and, thus, could not be applied or tailored for the non-experts evaluators.

Secondly, I formulated a set of requirements and objectives to this methodology (see Formulating Requirements to Methodology). In short, a methodology for the evaluation of structural design of websites should directly and proactively involve stakeholders in the evaluation of IA on their website. Moreover, the methodology should help to access and evaluate the structure of information environment (IE). To achieve it, evaluation methodology should be based on participatory experiences evaluation where "the roles of the designer and the researcher blur and the user becomes a critical component of the process" (Sanders, 2002, p. 2). Taking this approach, I suggest viewing website stakeholders as intermediaries that can contribute for a website ecosystem. Stakeholders, evaluating the website, can actively contribute or remediate existing website by providing feedback, critiques, and commentaries using this heuristic based toolkit.

Suggested methodology, on the one hand, should facilitate specialists in information architecture that would like to reduce internal pressure during a presentation of their work to clients or if IA specialists need convince stakeholders to make suggested changes into their shared information environment. On the other hand, the evaluation method should facilitate people who are not involved into the field of information architecture but face the need to access existing shared information environment. This need can arise if, for instance, an information architect presents newly redesigned website and stakeholders need to judge presented IA design, or if an owner of an existing information system wants to assess its design of information environment (IE) in context (see Why is it relevant?).

Thus, to answer my problem statement, I have chosen to focus my efforts on making heuristics for the evaluation of website construct. I have chosen to formulate heuristics because heuristic rules allows persons to test a website against a predefined set of rules and, on their basis, suggest improvements. Therefore, it is a design led oriented method. However, Nielsen's heuristics are expert oriented, whereas the methodology that I needed should be participatory oriented (see Figure 3-4). Moreover, I concluded that is not efficient to tailor existing Nielsen's heuristics because, among other reasons, it is not designed to evaluate IA (see What is missing from the heuristic evaluation approach?). Instead, I determined that to adapt the method to non-expert, the method should be based on a toolkit (see Heuristics as a basis for a toolkit).

Thirdly, based on widely accepted theoretical foundation within the field of IA, I formulated heuristics for Navigation IA component.

Heuristics that I suggest are not precise or formalized procedures. Instead, heuristics are guidelines, directions for problem solving. They provide the evaluator with directions and problem-solving suggestions. However, suggested heuristics are just a prototype. Therefore, I think that it is important to focus attention they are by no means the final version of evaluation.

Bringing up this problem is just an attempt to shed some light into a possibility of proactive involvement of stakeholders into the evaluation process. In my opinion, this problem arose after web design industry shifted to designing mobile-friendly websites and started to neglect underlying established rules of solid web design. Such neglect from standpoint of web designers resulted, in my view, in a need to involve stakeholders that should be interested to have well-structured and easy to use websites and can provide a third opinion on web structure.

In this master thesis, I focused on evaluating IA and suggested a method how it can be done on practice. However, this attempt is just a first step in making a working methodology for the evaluating the IA construct. Suggested methodology has missing joints. Moreover, to be sufficient they need to be tested on real users, evaluating real IA projects (see Prospective future work).

Finally, in the thesis, I concluded that to answer my problem statement and to suggest a methodology that is oriented on non-professionals, I should base the methodology on a toolkit. In my view, the toolkit invites going about IA evaluation with a hands-on perspective and involves stakeholders into a process of design on a late stage.

Suggested method, in my view, has some downsizes (see Formulating Requirements to Methodology). Among others, it might be costly to react on evaluators' contributing and to change or improve the website. Moreover, the method supports finding only severe mismatches. Furthermore, evaluators might oversee smaller problems. Finally, not all heuristics are relevant for all websites. To tackle, the last problem, however, on the card I indicate that not all heuristics are suitable for all websites (see Guidelines for the evaluation process).

Through the thesis, based on theories, my reflections and generalizations I have been identifying the features the toolkit should comprise. In the following subchapter, I make a summary on how a prototype of a toolkit should look like.

Toolkit

Thus, offering non-professionals taking a hands-on perspective in the evaluation of IA, I suggest introducing suggested heuristics to evaluators in the form of cards.

The idea behind this method is that after the presentation of his work to clients, IA specialist should use the cards as a tool that would clarify to stakeholders whether the IA construct on their website is solid. Thus, after stakeholders were introduced to their newly (re)designed website, they should be able to evaluate suggested IA structure with the help of these cards.

The set of cards should be suited for the evaluation of the majority IA constructs. Thus, one set of cards should consist of four different types of card, e.g. cards that evaluate only labelling IA component, cards that evaluate only navigation IA component, cards that evaluate only organization IA component and cards that evaluate only search IA component. Each type of cards should have own background color. Cards with similar background color should evaluate the same IA component.

Moreover, heuristics and explanations, introduced on the cards, should be rather general. Besides, the set of cards should be reusable. Hence, the same set of cards should be used in different projects. To achieve it, I suggest making cards on A4 paper so that a set could be printed out every time there is a need for the evaluation.

Furthermore, the cards should be self-evident and do not require prior knowledge in the evaluation. Therefore, each card that evaluates a new part of IA construct within this set should contain one or several heuristics that are supported with explanations, examples from different websites, supporting questions. Besides, on the card there should be a place for writing down thoughts, considerations or comments.

Additionally, every heuristic must be accompanied an evaluation scale that would allow to rate a severity of found issues on the end product. Besides, to answer my problem statement, and to allow non-professionals obtaining immediate results, I suggest using a scale with numeric values. For example:

No problem at all	Cosmetic issues only	Minor problems are present	Major problems are present	Unusable for majority of users.
0	1	2	3	4

In such evaluation scale, to obtain results it is necessary to calculate a sum of numeric values. Thus, a total number would indicate the quality of website's IA structure. For example, for Navigation IA component, a scale would look like that:

No problem at all	Cosmetic issues only	Minor problems are present	Major problems are present	Unusable for majority of users.
0-13	14-26	27-39	40-52	53-65

Finally, the set of cards should also have instructions that briefly explain how to use these cards. Here I suggest approximate instructions for the evaluation process:

Guidelines for the evaluation process:

- To use the heuristics, identify a website that you would like to evaluate.
  To evaluate the website:
- Read an explanation to heuristic rule(s).
- Read supporting questions (if any) and try to find an element on a website that answers the question
- Read the heuristic rule
- Compare your website to suggested heuristics.
- Use examples on the back side of the card for inspiration in answering the heuristics.
- Rate outcomes and support them with your comments, ideas, and thoughts.
- Evaluate both the main page, several random pages from a deeper levels of the site.
- For heuristics where you answered negatively try to determine the cause, write down your explanation.
- Draw up recommendations for improving the IA component under the review.
- Sum all digits and compare them
  Not all of the heuristics will be applicable to every project.
- If you are stuck with a heuristic rule and cannot come up with evaluation, comments or ideas, move on. Rate it "4" on the card.

To facilitate a group brainstorm:

- Read one heuristic aloud, and invite people to comment, share their ideas with the group as they come up with them. Take notes during this process.

The role of IA specialist during evaluation

I also find it relevant to mention the role of IA specialist in the evaluation.

While stakeholders conduct heuristic evaluation, IA specialist might document the discussion e.g. make tape recordings or write notes. In qualitative approaches note-taking in a discussion is the responsibility of the moderator and the note-taker. In the case with heuristics, IA specialist should wear shoes of discussion moderator. In other words, he should be responsible for taking very short and focused notes on specific things being said, or on issues, IA specialist deems to need further investigation. Moreover, I suggest that IA specialist should log notes on certain observations or on project relevant things that have been said. However, the notes should be properly documented because they might be used for website improvements.

Examples of toolkit

Discussed in previous subchapter ideas are summarized in the examples of cards for Navigation and Labelling.

The first who pictures visualize a cover of the set of cards for evaluating Navigation and Labelling IA components (see Figure 6-1, Figure 6-2). It contains explanation what is this method, provides evaluation instructions and assembly instructions.

Next picture shows a suggestion how A4 page, containing three evaluation 3 cards might look like (see Figure 6-3).

The last picture shows front page and back page of one card (see Figure 6-4).

Card design is by no means final and can be adjusted if necessary. It is only a prototype.

To sum up, on the basis of theoretical implications and my reflections that cover Navigation IA component of Information Architecture, I formulated heuristics for Navigation IA component (see Figure 5-8; Figure 5-9; Figure 5-11; Figure 5-13; Figure 5-20; Figure 5-23; Figure 5-29). To make heuristics visual I have assembled all of them in Appendix 1. Suggested methodology fulfils all requirements that I recommended in the thesis. Furthermore, suggested methodology was introduced in the form of a toolkit, which enables non-professionals to actively engage in the process of evaluation and obtain meaningful results.

Usage Instructions

To use the heuristics, identify a website that you would like to evaluate.

To evaluate the website:

Read an explanation to heuristic rule(s).

Read supporting questions (if any) and try to find an element on a website that answers the question

Read the heuristic rule

Compare your website to suggested heuristics.

Use examples on the back side of the card for inspiration in answering the heuristics.

Rate outcomes and support them with your comments, ideas, and thoughts.

Evaluate both the main page, several random pages from a deeper levels of the site.

For heuristics where you answered negatively try to determine the cause, write down your explanation.

Draw up recommendations for improving the IA component under the review.

Sum all digits and compare them

Not all of the heuristics will be applicable to every project.

If you are stuck with a heuristic rule and cannot come up with evaluation, comments or ideas, move on. Rate it "4" on the card.

To facilitate a group brainstorm:

Read one heuristic aloud, and invite people to comment, share their ideas with the group as they come up with them. Take notes during this process.

Assembly Instructions

Print one sided cover

Tri Fold

Print two sided cards.
Cut every printed page into 3 cards
Group cards with the same color in one cover

Evaluating Navigation

Information Architecture

- The cards in this deck will help you to review a Information arhitecture on this website

- The cards can be used for both individual and group brainstorming.

- They don't have to be used in order.

Figure 6-1 Cards on evaluating Navigation

Usage Instructions

To use the heuristics, identify a website that you would like to evaluate.

To evaluate the website:

Read an explanation to heuristic rule(s).

Read supporting questions (if any) and try to find an element on a website that answers the question

Read the heuristic rule

Compare your website to suggested heuristics.

Use examples on the back side of the card for inspiration in answering the heuristics.

Rate outcomes and support them with your comments, ideas, and thoughts.

Evaluate both the main page, several random pages from a deeper levels of the site.

For heuristics where you answered negatively try to determine the cause, write down your explanation.

Draw up recommendations for improving the IA component under the review.

Sum all digits and compare them

Not all of the heuristics will be applicable to every project.

If you are stuck with a heuristic rule and cannot come up with evaluation, comments or ideas, move on. Rate it "4" on the card.

To facilitate a group brainstorm:

Read one heuristic aloud, and invite people to comment, share their ideas with the group as they come up with them. Take notes during this process.

Assembly Instructions

Print one sided cover

Tri Fold

Print two sided cards.
Cut every printed page into 3 cards
Group cards with the same color in one cover

Evaluating Labelling

Information Architecture

- The cards in this deck will help you to review a Information arhitecture on this website

- The cards can be used for both individual and group brainstorming.

- They don't have to be used in order.

Figure 6-2 Cards on evaluating labelling

Looking at a website is essential to be able to point company's name, site name, brand, main topic, title of every page because this information adds credibility to the resource and evokes trust to the site's content and organization that stands behind the content.

Who is the sender of information?

What is the purpose of this communication?

What is the website about?

It is easy to see who the sender of information on the site is?

No prob-lem at all	Cosmetic issues only	Minor problems are pre-sent	Major problems are pre-sent	Unusable for majori-ty of us-ers.
0	1	2	3	4

_____
_____
_____
_____

The purpose of the site is clear.

No prob-lem at all	Cosmetic issues only	Minor problems are pre-sent	Major problems are pre-sent	Unusable for majori-ty of us-ers.
0	1	2	3	4

_____
_____
_____
_____

Imagine a situation where a visitor entered your information system through pages other than the landing page. Even though visitors landed on other pages of a system; they still need to be able to understand at a glance how to navigate the website, where they can go, and what kind of information it contains.

Where am I on this site?

Where can I go from here?

It is easy to point out where I am on this site, where can go further, and where is an exit point.

No prob-lem at all	Cosmetic issues only	Minor problems are pre-sent	Major problems are pre-sent	Unusable for majori-ty of us-ers.
0	1	2	3	4

_____
_____
_____
_____

There is a clearly identified link to the Home page

No prob-lem at all	Cosmetic issues only	Minor problems are pre-sent	Major problems are pre-sent	Unusable for majori-ty of us-ers.
0	1	2	3	4

_____
_____
_____
_____

Human mind has cognitive limits. Therefore, navigation must contain only essential items that cover appropriate breadth and depth in a topic that is introduced in your information system to your target audience.

What are the major sections of this site?

What does the navigation provide access to?

What page am I on? What is there on the site?

All major topics of the site are visible and accessible from the Home page

No prob-lem at all	Cosmetic issues only	Minor problems are pre-sent	Major problems are pre-sent	Unusable for majori-ty of us-ers.
0	1	2	3	4

_____
_____
_____
_____

Navigation appears on all website's pages.

No prob-lem at all	Cosmetic issues only	Minor problems are pre-sent	Major problems are pre-sent	Unusable for majori-ty of us-ers.
0	1	2	3	4

_____
_____
_____
_____

Figure 6-3 A4 paper with 3 cards for evaluation

Imagine a situation where a visitor entered your information system through pages other than the landing page. Even though visitors landed on other pages of a system; they still need to be able to understand at a glance how to navigate the website, where they can go, and what kind of information it contains.

Where am I on this site?

Where can I go from here?

It is easy to point out where I am on this site, where can go further, and where is an exit point.

No prob-lem at all	Cosmetic issues only	Minor problems are pre-sent	Major problems are pre-sent	Unusable for majori-ty of us-ers.
0	1	2	3	4

_____
_____
_____
_____

There is a clearly identified link to the Home page

No prob-lem at all	Cosmetic issues only	Minor problems are pre-sent	Major problems are pre-sent	Unusable for majori-ty of us-ers.
0	1	2	3	4

_____
_____
_____
_____

Figure 6-4 Front side and Back side of a card

Prospective future work

This thesis is devoted to suggesting a suitable methodology for the evaluation of structural design of desktop versions of websites that is based on a toolkit that enables non-experts to evaluate the website structure and obtain meaningful results from evaluation.

Working on this thesis, I discovered that the project was much more complex than I expected. Firstly, I experienced a lack of up to date publications related to the field of IA evaluation. Secondly, working with Rosenfeld et al. polar book, I have discovered that they refer to some "underlying design rules" (Rosenfeld et al., 2015). However, they do not elaborate further on these rules. In the first draft of the paper, I intended to suggest some design principles that Rosenfeld et al. base their book on. However, it appeared to be a complex analytical topic that demanded more research. Finally, working on the thesis, my original intention was to cover all four IA components in the thesis. However, due to page number laminations, I ended up covering only one IA component, namely Navigation.

Working on this topic in my master thesis, it appeared that no one else tried to evaluate website's IA actively engaging non-experts into evaluation. Therefore, I needed to provide extended Introduction where I explained the relevancy of this problem to both IA specialists and non-experts. Furthermore, working on a project, I realized that some attempts to evaluate IA components were made by different authors (Instone, 2000; Kalbach, 2007; Krug, 2006; Rosenfeld et al., 2015). Thus, some elaborated on evaluating Labelling component navigation, others contributed to Navigation component evaluation. However, no one attempted to combine all four IA components into evaluation. Moreover, the suggested evaluation methods were not widely adopted into IA community and were discovered under a thorough literature review.

Despite mentioned in the Introduction reasons why I think that this topic is relevant, working on the thesis I come to conclusion that this topic might be even more significant. Thus, I think that the topic of website evaluation becomes more relevant now due to a new web design trends, mentioned in the thesis. I think so because it seems that website developers forget the foundation of solid web design when they create attractive and graphically appealing websites because they make basic mistakes in labelling, navigation, search and organization IA components. The mistakes that web designers make, developing their websites, are rather severe. Therefore, they can be easily spotted even by non-professionals. Here, such methodology as I attempted to suggest, will come in handy. Therefore, before approving the final version of a website, I think, that it is a good idea to go through suggested web structure and evaluate it. Hence, I think that more practitioners will address the issue of website evaluation by website stakeholders in future.

Nevertheless, in the thesis, **I suggested that suitable methodology for the evaluation of structural design of desktop version of websites might be based on a heuristic review of the site's components. Moreover, to actively engage non-professionals into a process of evaluation, I suggested a toolkit introduced in the form of cards. The toolkit included heuristics, explanations, instructions, examples, questions, evaluation scales, and place to comments. Moreover, the toolkit gave immediate answer on how solid the IA of a website under review is using answer scales.**

Thus, I have answered my problem statement. In the thesis, I have set out a conceptual framework for evaluation of one out of four IA components. The thesis, in my view, provided a new insight into a field of IA evaluation. However, in the thesis I did not attempt to examine or test the toolkit in context.

Therefore, to make my findings more reliable and assess the quality of my findings the toolkit should be further developed and tested. Consequently, I recommend that future research, firstly, builds on suggested evaluation framework because proposed toolkit needs to be developed further by suggesting heuristics to

Labelling, Search and Organization components. Hence, before testing the toolkit, the toolkit should be further expanded because to evaluate IA the toolkit should be able to test all four IA components (Navigation, Labelling, Search and Organization). Thus, I suggest adding heuristics for Labelling, Search and Organization IA components. Moreover, after the development heuristics need to be included into a toolkit.

Furthermore, the future research should test the theoretical toolkit in context of IA projects. In other words, the toolkit should be tested in context of real IA related projects, where there is either a need for re-design the website, or when a website structure has been improved and newly suggested structure could be evaluated. Moreover, during the test period, both IA specialists and evaluators should contribute by giving feedback, suggesting improvements, pointing on threats and weaknesses of the toolkit (see Future work). For instance, it is worth monitoring whether such a tool is relevant to IA specialists, whether IA specialists run into similar issues, while presenting their work to their customers, how to approach these problems, etc. This can be done using construct validity assessment (e.g. a questionnaire or a survey).

7. Used literature

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Heuristics for navigation information architecture component

Website navigation

Who is the sender of information?
What is the purpose of this communication?
What is the website about?

It is easy to see who the sender of information on the site is.

The purpose of the site is clear.

Looking at a website is essential to be able to point company's name, site name, brand, main topic, title of every page because this information adds credibility to the resource and makes trust to the site's content and organization that stands behind the content.

"Users should always know what site they are in, even if they bypass the front door and enter through a search engine or a link to a subsidiary page" (Rosenfeld et al., 2015, p. 180).

Associative navigation

What are other relevant topics?
Is there anything else that I do not know but should?

The page provides access points to more relevant, more detailed or related information that come in handy when a user reads about the topic of interest.

An overview of other relevant topics indicates to a visitor that he is on the right track when looking for information.

"Associative navigation makes important connections across levels of hierarchy or site structure" (Kalbach, 2007, p. 91).

"associative navigation is particularly good for exploratory seeking and helps users uncover what they "don't know" but should" (Wodtke & Govella, 2009, p. 191)

Structural navigation

Where am I on this site?
Where can I go from here?

It is easy to point out where I am on this site, where I can go further, and where is an exit point.

There is a clearly identified link to the Home page

There is a clear indication of current location

Imagine a situation where a visitor entered your information system through pages other than the landing page. Even though visitors landed on other pages of a system; they still need to be able to understand at a glance how to navigate the website, where they can go, and what kind of information it contains.

"Knowing how deep you are in a site can give cues as to granularity and detail of information encountered" (Kalbach, 2007, p. 11).

"Provide the context within the greater whole" (Rosenfeld et al., 2015, p. 180).

""You are here" indicator can be the difference between knowing where you stand and feeling completely lost" (Rosenfeld et al., 2015, p. 180).

You should always follow the rules of thumb to ensure that your design provides contextual cues (Rosenfeld et al., 2015, p. 180).

"Users should always know what site they are in, even if they bypass the front door and enter through a search engine or a link to a subsidiary page" (Rosenfeld et al., 2015, p. 180).

Global navigation

What are the major sections of this site?
What does the navigation provide access to?
What page am I on?
What is there on the site?

All major topics of the site are visible and accessible from the Home page

Navigation must indicate "aboutness" of the site.

Navigation appears on all website's pages.

Navigation behaves consistently and predictably. For instance, it has pressed, hovered and visited state.

Human mind has cognitive limits. Therefore, navigation must contain only essential items that cover appropriate breadth and depth in a topic that is introduced in your information system to your target audience.

GN creates an idea what is the subject of matter on this site and sets expectations of users to content of the site (Kalbach, 2007).

"It is comforting to have a persistent navigation mechanism across the site" (Kalbach, 2007, p. 87).

"It tells you what the site is all about and what you should use it for" (Wodtke & Govella, 2009, p. 193).

GN adds to "understanding its relationship to other pages" because it "helps set context along with page titles and other elements" (Kalbach, 2007, p. 10).

It "should also present as much as possible of the structure of the information hierarchy in a clear and consistent manner, and indicate the user's current location" (Rosenfeld et al., 2015, p. 100).

"users don't expect to land somewhere completely unrelated when using main navigation" (Kalbach, 2007, p. 87).

Unexpected navigation behavior affects credibility (Kalbach, 2007).

Local navigation

Where can I go from here?
What is this site about?
What are other options within a given category?

Related information is linked together under a relevant category.

Navigation must indicate "aboutness" of the site.

Navigation must show enough information for people to understand what they will find, if they dig deeper into the website, what they can do in the website.

this navigation provides "access lower levels in a structure, below the main navigation pages" (Kalbach, 2007, p. 89).

It "enables users to explore immediate area" (Rosenfeld et al., 2015, p. 106).

It "provides a great deal of context... It plays a key role indicating "aboutness of the site. It also gives a sense of granularity of the content" (Kalbach, 2007, p. 90).

It supports exploratory seeking task (Wodtke & Govella, 2009).

Contextual navigation

Is there any other related topics/content on this site?
Can this website point to a new useful and related information outside the site?

There are smaller chunks of assess points that lead visitors to a new information inside/outside the site.

The text contains links that provide cross reference to other topics within the text.

Embedded links should be precise and to the point to help readers grasp their meaning without having to read the surrounding text.

Links in a website text and links to other relevant topics create a strong connection between the text and linked documents, articles, related pages and indicate topics indicates to a visitor that he is on the right track when looking for information.

Contextual navigation is a situational navigation that leads to similar pages at the same level within the site that lead to new, but related content areas that can be located internally or externally (Kalbach, 2007, p. 92).

"Contextual navigation supports exploration and may point people to new information" (Kalbach, 2007, p. 93).

Kalbach divides contextual navigation into embedded navigation and related links(Kalbach, 2007).

Contextual navigation is used "to suggest related topics and content in other areas of the site" (Farnum, 2002, p. 38).

Quick links

Is there a direct access to the information on this site that I frequently visit?

There is a chunk of navigation that gives an extra entry point to frequently accessed content areas on the site.

There is a chunk of navigation that highlights the key areas that are highly important, but are not presented in a top-level navigation.

Returning users are important target audience for website owners. These people have been on this website before. Consequently, they know what information they are looking for. Therefore, they would be pleased if a main page would have access points to a frequently accessed content on your site.

Quick links give access to important content or areas on the site that are not represented in a global navigation (Kalbach, 2007)

Quick links are contextual to entire site and often highlight frequently accessed areas on the site, promote areas deeper in the site (Kalbach, 2007, p. 93).

Adaptive navigation

Can a website suggest similar products or services?
Can a website point to the most popular item?
What do other people who bought this item bought?

A website makes recommendations based on information about related searchers from other users.

This feature is often used on a bigger commercial websites to boost sales. It is used to personalize the content by recommending similar products or services that can be potentially interesting for a client. For instance, "customers who bought this also bought" on Amazon website.

Adaptive navigation is a navigation that has a dynamic nature and provides links, which are generally based on other similar interactions on the same website (Kalbach, 2007).

It is used to make recommendations on information that can be potentially interesting to a visitor (Kalbach, 2007).

Footer navigation

Is there an end of this site?
Are there any important supplementary information to website's content?"

There is an area at the bottom of the page that indicates a dead-end of the site.

There is an area at the bottom of every page of the site that contains a cluster of supplementary information that is not pertinent to the main topic of the site.

Many users expect to find certain items at the bottom of the site. The information from this section gives users the opportunity to discover important information on your site, provide the first impression, and indicate the end of the site. For instance, the section at the bottom line of the page could provide supplementary information regarding:
— copyrights information
— contact information
— site map
— legal disclaimers
— website feedback links
— terms and conditions
— site credits
— link to social media, etc.

Footer navigation contains supplementary information not pertinent to the main topic of the site that does not address to specific user need, but address the legal requirement of site owners. (Kalbach, 2007, p. 93).

Utility navigation

Where is a tool that could help me?

There are tools and features that are grouped on either the top, sides or bottom of the page and assist visitors in using this site.

You can use a logo as a path to the main page.

Website's optimal performance should be more desirable than a catchy design. Thus, users consider to be standard that some elements function in a certain way, e.g. website's logo should bring visitors back to main page. Other navigation options are important to users in certain circumstances. However, it is placed the way that users can easily find them, if necessary. For instance:
— Login/Sign up
— Shopping cart
— Follow us
— Share
— Subscribe
— Follow
— Switch languages, etc.

Utility navigation connects tools and features that assist visitors in using this site" (Kalbach, 2007, p. 93).

"Utility navigation is placed adjacent to the global navigation, because it also needs to be accessible everywhere on the site" (Wodtke & Govella, 2009, p. 210).

Utility navigation is usually not part of the main topic of the site. Instead, it assists visitors using the site, leads to important functions, varying page types. For instance, logging in/out, access shopping cart, help pages, etc (Kalbach, 2007, p. 93)

Utility navigation can contain other important links that are not "handled well by other navigation types" (Wodtke & Govella, 2009, p. 29).

Internal page navigation

Is there more efficient way to a certain point on this site?

If a website's content is too long, there should be a button that allows jumping from one piece of content to another, and back.

Too long web pages are annoying to scroll. To navigate between sections of such a site efficiently and increase user persistence there should be a navigation option that allows moving from one section to another.

If the website content is too long it is advantageous to add the link that allows jumping from one page to another, providing a more efficient way to reach sections on a web and a reciprocal link back to the top (Kalbach, 2007, p. 93)

Browser functions

Why does not this mechanism work?

Back button, Forward button, History, Bookmarks, Favorites browser functions are operable.

Users expect that built-in mechanisms in browsers work the same way on all websites. Therefore, it is necessary to consider built-in mechanisms in browsers as a supporting navigation option and make sure that IE still works, if it is navigated by back button, forward button. Other built-in mechanisms in browsers to consider are: session history, browser history, URLs, bookmarking, page reloading, etc.

Built-in browsers mechanisms are frequently used and allow navigating IE (Kalbach, 2007, p. 93).

Research, analysis and testing revealed that users expect these features to work consistently (Rosenfeld et al., 2015, p. 179).

Users expect that "open URL allows direct access to the site's content, Back and Forward buttons provide a bidirectional backtracking capability, history menu allows access to pages visited in the past, bookmarks or Favorites enables users to save locations of specific pages for future reference" (Rosenfeld et al., 2015, p. 178).

Links &URLs

Is there more efficient way to reach a certain point on this site?

Each page has a human-readable URL

There are no broken navigation links

URL of the page reveals the structure of the site

Users often use different search engines to find information they need. Often visitors choose to search for information in the website that received the highest rank from the search engine. It is necessary to optimize its links to make the site search engine friendly.

There are other visual cues that visitors use navigating the site (Instone, 2000).

Practice shows that they are also widely used in navigation process (Instone, 2000).

Legend:
- navigation type
- questions
- heuristics
- explanation
- experts' opinion