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DESIGNING FOR PERSUASION
— A STUDY OF PERSUASIVE DESIGN METHODS THROUGH INFORMATION ARCHITECTURE

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Abstract

This thesis was written during our master study in Information Architecture 2018. In this thesis, we investigated the methods that are used within the field of persuasion and the potential for creating a new method based on the theory of persuasion and information architecture.

The research was guided by the following research questions:
How can a method for design and evaluation of persuasive technologies accommodate the issues identified when applying the PSD model?

- *What characterizes the methods used within the field of persuasive design?*

- *In which ways may information architecture contribute to a persuasive technology method?*

We chose to base the thesis on an extensive literature review, in which all the proceedings published in relation to the Persuasive Technology Conference from 2006-2017 were included. Based on a total of 340 papers, 16 methods were identified. These were synthesized into Sanders Research Design Landscape, in order to show the characteristics of the methods within the field.

Based on nine guideline, created based on the theory of persuasion and information architecture, the methods were analyzed and became the base of a new method called the DEDE method. With its four phases and two built-in stop blocks, the main difference with this method, compared to those identified in the field, was that not every technology would be considered persuasive, even if it changed attitude or behavior.

The main academic contribution of the thesis was this method, in which persuasion and information architecture were combined. Our secondary academic contribution was the overview of the characteristics of methods within the field of persuasion.

Preface

This master thesis is written in collaboration between Ea Kirstine Bork Hovedskou and Maja Færge Rabjerg, during their master in Information Architecture. The thesis is written in the spring semester 2018, as a culmination of interest sparked during a course in 2017 and the writing of the paper "What makes it persuasive".

The thesis is supervised by Sandra Burri Gram-Hansen, assistant professor at Aalborg University.

We would like to thank Sandra for many productive discussions and for the opportunity to challenge ourselves and each other, in a field that we find interesting. We would also like to thank IT-Vest and International Office for making our attendance in the Persuasive Technology Conference 2018 possible.

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Reading guide

To support the reading of this research, we have created the following reading guide. To visualize the structure we have created Figure 1.
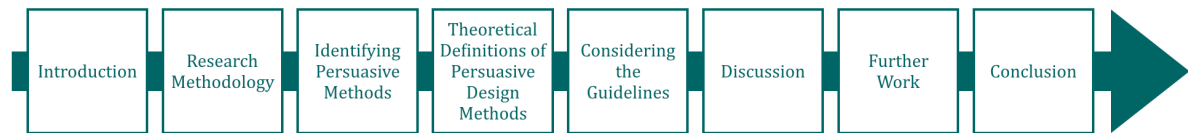

Figure 1 - Structure of the thesis

Before each chapter this figure will be presented, to illustrate where in the process the chapter is placed and what comes before and after it. An overview of all the figures and tables presented in this thesis is available in appendix 1 and appendix 2. We present a summary of each chapter in this reading guide to support navigating through the thesis.

Introduction

In the introduction we present the inspiration and the focus of the thesis, as well as the research question, which will be guiding the following research. This introduction presents the paper *What Makes It Persuasive?* (Gram-Hansen, Rabjerg, & Hovedskou, 2018), which the research done in this thesis is a continuation of.

Research design

In this chapter we describe the design of the research. This includes a description of the theoretical approach to the research as well, as the literature review, which will be the center of the thesis.

Identifying persuasive methods

Based on the introduction, the research question and our research design, this chapter explains the process of the first three steps of the structured literature review – Search, Appraisal and Synthesis - based on the literature published in relation to the Persuasive Technology Conferences. This is done to create an understanding of which methods exist within the field of persuasive technology and the characteristics of these.

Theoretical definition of persuasive design methods

As the previous chapter produced an identification of a number of methods, we need to define not just how we understand persuasion, but also structure our understanding of designing for persuasion. This is necessary to give a framework for how to continue to analyze the identified methods, and what characteristics they have and how this might vary from the needs we identify.

To create this framework, we first consider how different understandings influence the requirements of a persuasive design or evaluation process. We further argue for the combination of information architecture and persuasion through a common background in rhetoric. We give an explanation of the different components of information architecture, so these can be referenced in the later analysis.

The outcome of this work is therefore a combined framework of information architecture and persuasive technologies.

Characteristics of a model

At this point in the thesis, we return to the methods with our defined framework in mind and analyze them in more depth. This part of the thesis is therefore more theory led, in which the predefined theory explains what to look for in the literature. The outcome of this part of the analysis will be defining characteristics of a persuasive design model, based on the theory as well as the existing models. With these identified, a design model will be proposed.

Discussion

In this chapter we discuss the results of the analysis, as well as our process. First, we discuss how to overcome what we in the literature have identified as the 1-use curse. We then discuss the structure of our literature review and how it influenced our results. Finally, we discuss if the difference between design and evaluation has an influence on our results.

Further work

In this chapter we consider what further work could follow this thesis. We propose three approaches in the form of an evaluation of the proposed method, a new literature review based on the identified methods and an extended review, where the characteristics of case-specific methods are taken into consideration.

Conclusion

Finally, we conclude this thesis, by presenting the findings of all the previous chapters. They will be summarized in this chapter and the research questions will be answered.

1 Introduction
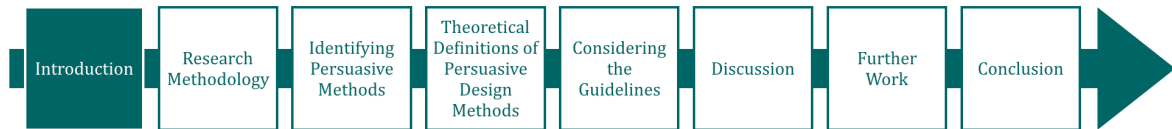
In this thesis we investigate the methods that are used within the field of persuasion and the potential of creating a new method based on the theories of persuasion and information architecture. This is done through a theoretical approach and is based on an extensive literature review of the papers published in the Persuasive Technology Conference proceedings. We then categorize the existing methods to understand their characteristics. They are compared to theoretical pointers from the fields of persuasion and information architecture, in order to propose a new method based on them and the needs of the field. The focus of this thesis, as well as our methodological approach, constitutes a continuation of research we conducted and subsequently published in collaboration with our supervisor in late 2017.

The perspectives presented in the paper originate from an elective course held by Sandra Burri Gram-Hansen during our 8th Semester, in which two activity trackers were analyzed using the Persuasive System Design model. This work inspired us to co-author the paper *What Makes It Persuasive?* (Gram-Hansen et al., 2018) that was accepted to the Persuasive Technology Conference and was presented in Canada in late April 2018. The paper can be found in appendix 3.

In the paper we present the results of an analysis of two activity trackers by Garmin - one for adults and one for children. The analysis was conducted using the Persuasive System Design model, created by Oinas-Kukkonen (Oinas-Kukkonen & Harjumaa, 2008). The method consists of four categories: primary task-, dialogue-, system credibility- and social support. Each category has its individual principles and the four categories have a total of 28 design principles. Together these principles are meant to help designers understand both the information content and the software functionalities (Oinas-Kukkonen & Harjumaa, 2008). Our results show that when we apply the model to the technologies, the version meant for children seemed more persuasive than the one meant for adults, due to a larger number of persuasive principles being applied. We find however, reason to question the results, when we look further into what defines persuasion and where it is applied.

The results of our analysis are visualized in tables for each category of principles, so that they more easily can be compared. In the tables 'x' indicates that the persuasive principle is found within the system. If you only consider these tables, there are almost as many 'x's for one technology as the other. You might therefore conclude that the two technologies are equally persuasive, or that the one with a few more x's is more persuasive. However, the method does not lead us to question the placement of the principles in the technology, or whom the principles are

meant for. One of our concerns is that many of the persuasive principles for the activity tracker for children, are not accessible for the children but instead for their parents. Even though the persuasive principle is present in the technology, it is not available to the intended user. We find that the method lacks the ability to describe exactly where in the technology the persuasion is happening, and connecting this to the needs and ability of the intended user. Based on our understanding of the model, it ends up being a checklist for persuasive principles, rather than a method that supports choosing the right principles for the intended user. Another concern is that at no point do the method lead us to question whether it is ethically appropriate to try to persuade a child. We do identify the child as the intended user, but do not question how this influences the purpose or design of the technology itself.

These issues are made more apparent by the lack of process in the method. Each of the steps seem disconnected when we approach them, and the results of the steps have no influence on each other. This means that the results of considering the user and the context, in which the technology should be used, do not actually affect the principles and the design itself. So while we find each of the categories an interesting starting point for discussing what might influence the persuasion of the technologies, they have minimal influence on the results. This risks enabling a problematic technology to seem persuasive. This is described as follows:

"However, in our interpretation of the framework, it may be beneficial if the Persuasion Context, is to be considered a reflection benchmark to which all other analytical findings should be related – and potentially a preclusion for further analysis in order to avoid that all interactive systems will potentially be considered persuasive." (Gram-Hansen et al., 2018, p. 26)

The frustrations found with the use of the Persuasive System Design model led us to question, if it is possible to overcome these challenges about a lack of process and understanding of placement of the persuasive principles, through the inclusion of information architecture. To do so, we also need to consider if any of the existing methods already have considered the issues we experienced.

Information architecture is the study of how to structure information so that it is accessible and easy to use for the right users. With one of the main challenges being organizing the persuasive principles, this is a fitting approach towards considering persuasive design. We want to examine if a proposal of a new method based on this approach, might benefit the field of persuasion.

Our thesis is therefore a continuation of the research presented in the paper *What Makes It Persuasive?* (Gram-Hansen et al., 2018). We will reflect on the methodical approaches within the field of persuasion and create an understanding of the existing methods in the field. We will furthermore examine if an inclusion of information architecture can support these methods.

1.1 Research question

Based on the introduction and the challenges presented, we find it interesting to continue examining methods for persuasive design, by using an information architecture approach. This leads us to consider the following research questions:

How can a method for design and evaluation of persuasive technologies accommodate the issues identified when applying the PSD model?

- *What characterizes the methods used within the field of persuasive design?*

- *In which ways may information architecture contribute to a persuasive technology method?*

To answer our research question we take a theoretical approach. Our results will therefore reflect being made based on theory and not empirical material.

The main academic contribution of this thesis will be a proposed method for how to perform persuasive design, while including consideration of information architecture. This method will be founded in the theory of the two fields, and should overcome the issues we have experienced with the Persuasive System Design model.

During our participation at the Persuasive Technology Conference 2018 in Canada, we became aware of a need for a deeper understanding of the different methods used within the field of persuasion. The results of our literature review, which identifies characteristics of methods within persuasion and proposed guidelines for what such a method should be based on, are therefore our secondary academic contribution.

2 Research design

In the following chapter, we present the research design for this thesis, to give the arguments as to why we have chosen this approach to answer our research question. We present our approach towards our research, in the form of a structured literature review. This is the focal point of our thesis.

We choose to approach this research through the paradigm of pragmatism. When conducting any form of research, the way you choose to do it and why, can be a result of your understanding of the theory of science. It is not just a matter of doing it either qualitative or quantitative. Research is about systematically collecting, analyzing and interpreting data. Every researcher works based on their own background and the theoretical framework they have available. While there are four main paradigms of conducting scientific research, we believe pragmatism to be the best fit for this research design.

The characteristics of this paradigm is that contrary to other paradigms, it does not belong within just one form of philosophy. When conducting research within this paradigm, you place the problem itself within the center of your research, rather than the theories that should be applied. Instead, you look into *what* and *how* through the methods that are most likely to provide insight to the problem, without looking into what philosophy the method normally belongs to. Therefore, unlike other paradigms, pragmatism does not have methods, which are characteristic for it. (Mackenzie & Knipe, 2006).

This understanding of research is fitting for this thesis, as we work problem-based. Our research is not designed based on theories of how to conduct research, but instead on how to best solve the problem. This means that the approach to the research design can be adapted during the actual research process, so that the methods used are those that are most effective to consider the problem.

Based on this approach and our research question, our chosen research design is centered on performing a structured literature review. The review is adapted to fit the needs based on the research question, during the design process.

2.1 Literature review

When conducting research, ensuring that a problem field is fully understood, and that important perspectives are not left out of the equation can be a challenge. One way to do so is by conducting a literature review. As written in regards to conducting research without considering all the already existing literature in the book *Systematic Approaches to a Successful Literature Review* (Booth, Papaioannou, & Sutton, 2012)*:*

> *"You will not only face the danger of reinventing the wheel but, even more critically you will run the risk of reinventing the flat tyre."* (Booth et al., 2012, p. 2)

By performing a literature review you both ensure that you do not just reiterate what someone else has already discovered and that you do not end up presenting something, which has already been proved wrong. For this thesis, the literature review serves a further purpose, as it will also be the base for this research's data collection. It is not just a matter of understanding what has already been done within the field. Instead, the literature review is the data gathering that the results of the thesis are based on. This proves the thesis to have a theoretical approach, rather than empirical testing.

A literature review is a systematic and reproducible method for identifying and evaluating the already existing body of recorded work by researchers, scholars and practitioners. It is important to note that a review always should be systematic, so it can be done efficiently while also ensuring a high quality of research. This means that when a literature review is conducted, each step needs to be explained and you need to be able to argue every choice that is made. This limits the possibility of selection bias in the literature of a project. It is about finding the whole truth, and not only the literature which supports your own perspective (Booth et al., 2012).

There are different purposes for a literature review. It can be done to position your own work within the existing literature, identify what has already been covered by previous scholars or describe how each work relates to other works (Booth et al., 2012). The purpose of the method in this thesis is to look for gaps in previous studies.

To conduct a structured review there are four main processes to consider: *Search-, Appraisal-, Syntehsis-* and *Analysis process.* Together these processes are called *SALSA* and is illustrated in Figure 2 (Booth et al., 2012).

Figure 2 - The SALSA process

What each step entails as well as how it has been conducted in our research will be described in the following chapter, when the results of the process are presented. This separation is necessary, because even though each step of the review is structured and defined by the theory behind it, the execution of it is influenced by our pragmatic approach. This means that other methods are included as necessary to fulfill the purpose of the processes. To be able to most effectively describe how and why this is done, these descriptions need to be presented during the process, which is why the details are not presented here. The first three steps of the review help us to identify the existing methods within the literature. The result of this research is therefore a list of methods and an understanding of how these are related to each other. The final part of the review examines the different identified methods in more detail.

With the research design presented showing how our literature review will be the focus of the research, we will now start the review itself.

3 Identifying persuasive methods

In this chapter we use the previously described SALSA method to conduct a structured literature review. Before this can be done, we describe the background of persuasive technologies in the form of persuasion. This is done to add context for the literature and the methods presented in the analysis. The purpose of the chapter is to create an overview of the different methods used within the field, and how they are related to each other.

3.1 The background of Captology

In 2003 B.J. Fogg publish the book *Persuasive Technology: Using Computers to Change What We Think and Do* (Fogg, 2003), in which he discusses how technologies can persuade people into changing their behavior. He believes this is possible, as technology has become a more integrated part of everyday life. He consider websites the most persuasive technologies, but not without predicting that more diverse versions of such technologies will emerge in the coming decade. To describe this phenomenon he coin the word *captology* based on the phrase computers as persuasive technologies. Figure 3 shows how the field of captology is constituted within the overlap between persuasion and computers.
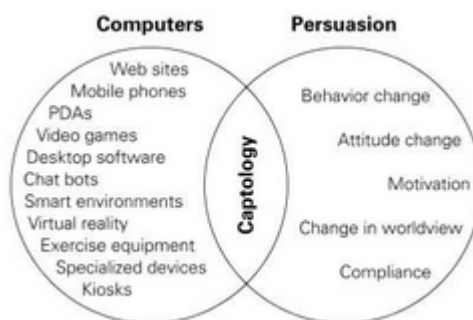
Figure 3 - Capotogy (B. J. Fogg, 2003, p. 5)

He further argues that the focus of captology is the:

"*design, research and analysis of interactive computing products created for the purpose of changing people's attitudes or behaviors*" (B. J. Fogg, 2003, p. 5).

The figure and this description explain how Fogg defines persuasion as mostly related to behavior change, attitude change, motivation, change in worldview and compliance. He later defines

persuasion more specifically as "*an attempt to change attitudes or behaviors or both (without using coercion or deception)*" (B. J. Fogg, 2003, p. 15), while acknowledging that this a broad definition of the term. What he emphasizes is that you need to separate persuasion from coercion. This is where you make someone do an action by using force or deception, or in any way by tricking someone into acting a certain way. Persuasive technologies are therefore not just any technology that aims to change behavior or attitude. He further elaborates that persuasion always needs to be intentional. Any changes that happens as a side effect of a technology, does not belong under this definition of persuasion, if the designers do not intend it to happen. Even if users use a technology to persuade themselves into acting in a specific way, it will not necessarily be related to the field of captology, if this is not also the intent of the technology when it was designed.

Fogg continues to describe a framework for understanding captology, called the *Functional Triad*. He describes how computers differ from the way traditional forms of media persuades, as computers can support the persuasion process through interactivity. They can react and adapt to different cases and input. The functional triad identifies three different roles that a computer can take. The framework is meant to support considering persuasive technologies. The three roles Fogg proposes computers can belong to are:

- Tools
- Simulation
- Social actors

Depending on what role a technology takes, people might use or respond differently to it. If you consider a computer as a tool, then the computer is something that is supposed to be a support to the user. This is done by making activities easier, by e.g. leading the user through a process or motivate through calculations or measurements. If computers on the other hand is thought of as a media, they are used as a way to simulate information. This might persuade by providing simulated experiences and helping users to rehearse a behavior. The last role a computer might take, is as a social actor. This means that people respond to an interactive technology, as if the technology itself is a living entity. For this type of technology to persuade, it will use the same principles as humans would use to influence others - like positive feedback, social support and modeling target behavior or attitude.

These three perspectives are intended to help designers to choose the right persuasive strategies, by giving them a framework for looking at a technology and its purpose from different angles. They should be able to use this tool even without them being experts within the field of persuasion or psychology.

This understanding of persuasive technology as captology, is the foundation of the field of persuasive technology. When we in the following sections describe the results of the first three processes of our literature review, it is therefore with this understanding in mind.

3.2 Search – Identifying the literature

In this section we first describe the theory behind the search process. We do so, to present the framework in which our research is performed. We then explain our approach towards the process. Finally, the results of this process will be presented as a list of literature, which will be analyzed in the following processes.

Searching for literature is a step in which you need to be especially careful about discovering all the necessary literature. You should not just do a selective search where only part of the truth is discovered. The search for literature needs to be guided by a specific research question. This is used to scope the search to not only include the necessary literature, but also guide what type of information you actually need. The type of search, breadth and approach all depends on the topic of the review – but by being systematic it is more likely that you identify all relevant literature within your scope (Booth et al., 2012). Our review and choices are guided by the research question in section 1.1.

When considering the search processes of our literature review, the Persuasive Technology Conference and the proceedings published in relation to it will be the scope of our search. The first Persuasive Technology Conference was held in 2006 and the scope of the literature review will be up to and including 2017. This is because 2017 is the latest published year at the beginning of the writing of this thesis.

The reason we only search for the literature published in relation to this conference, is that the conference is considered the center of the field of persuasive design and technology. It represents an extensive body of research knowledge that has been double blind peer reviewed. There is therefore no reason to search for literature outside these publications, as all relevant papers for design of persuasive technologies are most likely published here. We search for the entire published proceedings within the given timespan, so nothing is arbitrarily excluded during the literature search. The literature found here is the base for the following steps of the analysis.

During the search for literature published in relation to the Persuasive Technology Conference from the year 2006 to 2017, there are 11 different proceedings to find. Nine of these proceedings is published through Springer and includes only full- and short papers, while year 2009 and 2011 is published through ACM Digital Library. These include, besides papers, also panel descriptions and workshop descriptions. In total 340 pieces of literature are found. The distribution of these through the years can be seen in the following Table 1:

Year	Publisher	Number of articles	Citation
2006	Springer	33	(IJsselsteijn, de Kort, Midden, Eggen, & van den Hoven, 2006)
2007	Springer	37	(de Kort, IJsselsteijn, Midden, Eggen, & Fogg, 2007)

2008	Springer	32	(Oinas-Kukkonen, Hasle, Harjumaa, Segerståhl, & Øhrstrøm, 2008)
2009	ACM Digital Library	39	(Chatterjee & Dev, 2009)
2010	Springer	28	(Ploug, Hasle, & Oinas-Kukkonen, 2010)
2011	ACM Digital Library	11	(Stibe & Haugtvedt, 2011)
2012	Springer	26	(Bang & Ragnemalm, 2012)
2013	Springer	30	(Berkovsky & Freyne, 2013)
2014	Springer	27	(Spagnolli, Chittaro, & Gamberini, 2014)
2015	Springer	23	(MacTavish & Basapur, 2015)
2016	Springer	31	(A Meschtscherjakov, De Ruyter, Fuchsberger, Murer, & Tscheligi, 2016)
2017	Springer	23	(De Vries, Peter W, Oinas-Kukkonen, Siemons, Beerlagede Jong, & Van Gemert-Pijnen, 2017)

Table 1 - Search results

As previously mentioned, the years 2009 and 2011 have a different format than the rest of the proceedings. We choose to include everything published in the proceedings in our review, to ensure that we do not arbitrarily exclude any literature.

According to ACM Digital Library, only 21 articles were accepted in 2009. With 39 pieces of literature found, the remaining 18 papers are panel descriptions and workshop descriptions. 11 articles were accepted in 2011, which corresponds with the number of literature identified. This means that 2009 is the only year in which other types of literature are included. We also have to be aware that some of the uploaded panel descriptions were identical in 2009, so only one copy is included in the final body of literature.

With this literature identified, we believe to have found the essential literary knowledgebase for examining the previously mentioned problem field. Based on the 340 articles, we can now continue with the appraisal step of the literature review.

3.3 Appraisal – Quality and relevance

Based on the results of the first process, we now assess the value of the literature. Firstly, we describe the purpose of the appraisal step as presented in the literature. Then we discuss our results along with the description of our process. The purpose of this step is to identify which methods are used in the identified literature, which will be used in the following step of the review, in order to understand the characteristics of their approach.

During the appraisal process the literature is assessed both for its quality and its relevance. It is important to consider the quality, so that only high quality literature is included in the review. However, it is just as important to assess whether the selected papers bring value to the current research. As with the search process, it is necessary to apply a systematic method, to limit selection bias within the review and ensure that relevant studies are not excluded by mistake (Booth et al., 2012).

When we consider the quality of the found literature, we base our decision on the fact that to be accepted within the proceedings, full and short papers are double blind peer reviewed. All found literature has therefore already been reviewed and proven to be of a high quality.

To identify the relevant literature as the second part of the appraisal, we are guided by the research question as described in section 1.1. This gives us the scope of identifying the papers, which gives us insight to the methods of the field. To identify the relevant papers, we go through several exclusion steps. To do this, we apply the coding program NVivo.

3.3.1 Coding of literature

To sort the papers from the Persuasive Technology Conferences we need a system to analyze the literature. We choose to use the program NVivo to keep track of our results. NVivo is a software program for qualitative research produced by QSR International. The program can be used for analysis of unstructured text, audio, video and image data (QSR International, 2018b).

In NVivo you can organize and store data, which makes it easy to navigate through a big amount of data like ours. With the 340 papers from all the Persuasive Technology Conferences it is possible to categorize the papers by conference year, while still being able to search across the years. This makes our work more efficient without limiting our options.

In NVivo you can use *Nodes*, which can be used to categorize the data and support the appraisal process. It is possible to create both theme nodes and case nodes. The theme nodes can be used when you are categorizing your data in themes or topics and the case nodes can be used when your data include people, places, sites or organizations. To support our research we used theme nodes. This made it possible to categorize our papers in different themes and thereby make an overview over the 340 papers (QSR International, 2018a).

3.3.2 Method and Theory - Initial categorization

We want to use the papers from the conferences to get an overview of how it is possible to use persuasive technology to design and evaluate systems, which is why we initially distinguish between which papers are methodical and which are theoretical. Since we are looking to find different methods used to design or evaluate persuasive systems, it is necessary to sort the literature into the methodical papers and the theoretical papers using a *Method* node and a *Theory* node in NVivo. When looking for the theoretical papers we are looking for the papers where a theory is presented. This node also includes papers, which describe a research method, a new technology without method considerations or other papers that do not contain the use of an actual method. If the paper consists of either a presentation of a method or a use of it in a certain way or in a specific case, the paper is categorized with a method node.

In order to consistently categorize the 340 papers, we structure the categorization by defining how to consider each paper. When sorting the papers by method and theory, we decide to focus on the abstract of each paper. The abstract is designed to summarize the content of a paper and give an understanding of its subject. This made it suitable to consider when conducting the categorization. If it is not clear through reading the abstract whether the paper is method-based or theory-based, we continue to read the introduction and/or the conclusion. We are aware that this approach can influence the categorization of the papers as some details might be missed. However, with such a big amount of papers to consider within a limited timespan, this is deemed to the most appropriate way of doing it. Table 2 shows the results from the first categorization of the papers, based on this approach.

Methods	195
Theory	145
Total	340

Table 2 - Method and Theory categorization

Out of the 340 papers, we find that 195 of them are methodical and 145 are theoretical. This means that a little over half the papers are methodical. This shows that within this field, many of the papers focus on presenting methods or using them to either design or evaluate systems. Due to this sorting we can now focus on only the relevant methodical papers and exclude the rest of the literature from the following appraisal process.

3.3.3 Design and Evaluation - The purpose of the methods

With the first categorization done, we continue to consider whether the methods used are primarily meant for use in designing persuasive technologies or evaluating them. This gives us more insight about the types of methods that exists within the field. If we find that a method is used to explain how to design a persuasive system it is given the node *design*. If the method is used to evaluate a persuasive system it is given the node *evaluation*. This coding only adds to the insights about the types of methods within the field and is not used to exclude or include any of the papers. Table 3 shows the results from the second categorization of the papers.

Design	113
Evaluation	114
Total	227

Table 3 - Design and Evaluation categorization

Our results show us that out of the 195 methodical papers, 113 of them are design oriented and 114 are evaluation oriented. The results are very equal, which shows that within the field of persuasive technology there is equal focus on using methods for designing and using methods for evaluating systems. It is worth noting that the total amount of papers are bigger than the total amount of methodically papers – 32 papers more to be exact. The difference is caused by some of the papers being considered both design and evaluation oriented, since it is not possible to exclude one from another and they are therefore given both nodes.

3.3.4 General methods and Case-specific methods

At this point in the appraisal process we have narrowed the amount of papers down from 340 to 195 by excluding all the theoretical papers – leaving only the methodical papers. However, not all of these papers are relevant for our research. Because our research questions point toward identifying a method that can be used for system design and evaluation, we identify which papers present methods that can be used for all cases and not just in specific scenarios.

To do this, we sort the remaining papers by coding them with the nodes *General Methods* and *Case-specific*. The case-specific methods are methods that are developed and designed to only support one specific case or scenario, e.g. guidelines for how to design motivating message software for eating healthy (Thomas, Masthoff, & Oren, 2017). The general methods on the other hand are the non-specific methods that can be used more than once, as a tool in different types of cases.

In order to sort the papers with these nodes, it is necessary to go through the papers more thoroughly than we did in the previous step. We focus on the introduction of the paper to get an understanding of the paper's purpose. We also consider the method section where the method used in the paper is described. This provides us with enough information to see what type of method is described.

General methods	47
Case-specific methods	148
Total	196

Table 4 - General and case-specific methods categorization

Sorting the papers by these nodes show us that only around a quarter of the methodical papers are describing general methods, as seen in Table 4, which narrowed our collection of papers down to only 47 papers. With an overview of which papers to consider, we can get an overview of what methods they are presenting. This is done to learn how many different methods are used in the papers.

3.3.5 General methods overview

After giving 47 papers the general method node, we go through them again. This time we give each general method their own node. Some of the general methods are the same and are used in several papers and some are only described in one paper. The name of the methods and how often they occur in the method literature is shown in Table 5.

Appeal Belonging Commitment	1
Behaviour Change Wheel	1
Behavior Grid	4
Behavior Wizard	1
Design with Intent	1
EDIE	1

Fogg Behavior Model	5
Fogg's Eight-Step Design Process	2
Functional triad	3
General Persuasion System	1
Influence components model	1
Inspiration Card Workshop	1
Participatory Design	2
Persuasive Potential Questionnaire	1
Persuasive System Design Model	21
Value Sensitive Design	1

Table 5 - Overview of general methods

We identify 16 different methods, which each are meant to be used as a general method for designing or evaluating persuasive systems. Out of those 16 the majority (10) are only used in one paper. Five of the identified methods are found in two to five papers, out of which BJ Fogg has created four out of the five. The Persuasive System Design model is the most used method and is used in 21 papers. However, the review also shows that 11 of these papers are with researchers from the University of Oulu and out of these, 10 papers have Oinas-Kukkonen as either author or co-author (Harjumaa, Segerståhl, & Oinas-kukkonen, 2009; Langrial & Oinas-Kukkonen, 2012; Lehto & Oinas-Kukkonen, 2010; Oduor & Oinas-Kukkonen, 2015, 2017; Oinas-Kukkonen, 2010; Oinas-Kukkonen & Harjumaa, 2008; Räisänen, Lehto, & Oinas-Kukkonen, 2010; Stibe & Oinas-Kukkonen, 2012; Stibe, Oinas-Kukkonen, Bērziņa, & Pahnila, 2011). So while it is the most used method, its use is primarily within the context of the one who proposed the method.

3.3.6 Description of general methods

With the methods identified we proceed to read all the 47 general method papers fully and write a description of each method. We find it necessary to describe the methods, to define how we understand them based on the identified literature. This is done so that whenever we refer

to the methods in the following analysis, it is clear what method we are referring to and what it contains. These descriptions are presented in this section and contains the name of the method, the name(s) of the paper(s) in which the method is used, a description of the use of the method and finally summary of the process of the method. The list is sorted alphabetically.

Appeal Belonging Commitment

Name on paper:

- Determining the Determinants of Health Behaviour Change through an Online Social Network (Kamal & Fels, 2012)
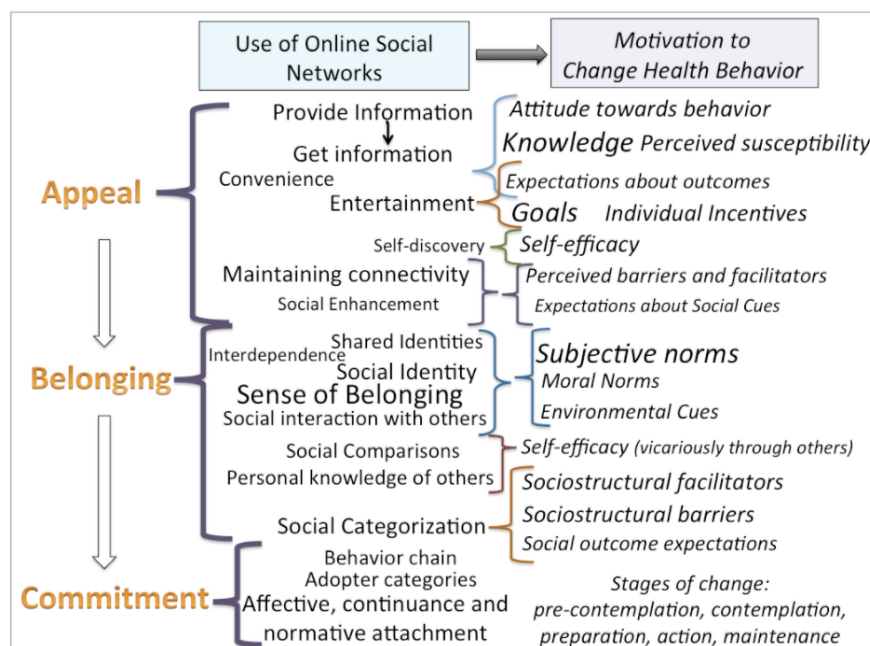

Figure 4 - Appeal Belonging Commitment

Description: The Appeal Belonging Commitment framework (Figure 4) is based on a review of existing theoretical models, that all have in common that they are used on online social networks, aiming to design and evaluate systems that are meant to influence long term behavior change. It can therefore be used for other types of systems as well.

The framework consists of three dimensions for online social networks: *Appeal* – individually based, *Belonging* – socially based and *Commitment* – temporally based. At first, systems need to appeal to the users on an individual level in order for it to be used. When it is appealing, it has to promote belonging, which can be promoting social norms. Finally, the system needs to promote commitment, to make sure the users get into the habit of using it.

Process: Appeal, Belonging, Commitment

Behaviour Change Wheel

Name on paper:

- Office Workers' Perceived Barriers and Facilitators to Taking Regular Micro-breaks at Work: A Diary-Probed Interview Study (Huang, Benford, Hendrickx, Treloar, & Blake, 2017)

Description: Behaviour Change Wheel is a guide to the process of selection and translating theories into intervention design. It is supported by *COM-B*, which is a behavioral model that divides behavioral problems into three aspects, which each has two subcomponents: *Capability* - psychological and physical, *Opportunity* - physical and social and *Motivation* - automatic and reflective. Aside from these three aspects, the Behaviour Change Wheel also operates with nine general intervention functions – which furthermore has 93 Behaviour Change Techniques.

The Behaviour Change Wheel was made as a further development of the Fogg Behavior Model. Where Fogg Behavior Model is used for analyzing behaviors, the Behaviour Change Wheel is made to translate the behavioral analysis into the design of specific intervention features. The features are based on the aspects from COM-B and Behavior Change Wheel which produces the change.

Process: Capability, Opportunity, Motivation

Behavior Grid

Name of papers:

- Behavior Wizard: A Method for Matching Target Behaviors with Solutions (B. J. Fogg & Hreha, 2010)
- Reinforcing preliminary design strategy selection guidelines with insight from Fogg's behavior grid (Daae & Boks, 2011)
- Successful Persuasive Technology for Behavior Reduction: Mapping to Fogg's Gray Behavior Grid (S. S. Ferebee, 2010)
- The Behavior Grid: 35 Ways Behavior Can Change (BJ Fogg, 2009b)

What Type of Behavior Change?

On What Schedule?		A — perform new behavior (unfamiliar behavior)	B — perform existing behavior (familiar behavior)	C — increase behavior (frequency, intensity, or duration)	D — decrease behavior (frequency, intensity, or duration)	E — stop behavior (cease ongoing behavior)
1	one time behavior	Take a new type of survey online	Purchase book at Amazon	Buy additional books online today	Spend less time on mySpace today	Don't eat desert tonight
2	one time behavior that leads to ongoing obligation/cost	Adopt a dog	Agree to host a party	Agree to pay more on mortgage	Pay less on a credit card one time	Refuse to continue chemotherapy
3	behavior for a period of time (X has a duration)	Play a new video game for one hour	Exercise for 30 minutes	Floss longer for two weeks.	Spend less money on books this month	Don't complain about anything today
4	behavior on a predictable schedule (X gets repeated, periodicity)	Attend online class each week for a month	Gamble online each morning at 10am	Exercise with higher heartrate each morning	Eat smaller portions for dinner.	Don't smoke after dinner each evening
5	behavior is on cue (X is cued irregularly; it's a change in habitual response)	Report any spam to AOL	Drink water at each fountain you see.	Write a longer thank you note after a dinner party	Control your frustration when driving in gridlock	Don't buy anything at checkout stand
6	behavior is at will (can perform x at any moment)	Read website privacy policy	Check computer for viruses	Check for computer viruses more often	Drink less coffee	Stop interrupting during conversations
7	behavior is always performed (X means change in habit, in way of being)	Use Google for online searching	Maintain good posture	Think thoughts of appreciation	Reduce energy consumption in home	Stop cursing

Figure 5 - Behavior Grid

Description: BJ Fogg introduced The Behavior Grid in 2009 (Figure 5). The method is meant to help designers and researchers to organize the way they think about behavior change. The grid consists of two axes: Type of Behavior Change and Schedule. Along the first axis the designers must consider what type of behavior change they are either seeing or aiming towards, depending on if the method is used for design or evaluation. On the second axis, the designers must consider what timespan it is within – is it for a one-time behavior change, all the time, on cue etc. The 35 different behavior types then correspond with a specific set of theories, strategies and techniques that you can look into. In the four articles in which the Behavior Grid is present, one is the presentation of the method along with an evaluation of Facebook to show how it is used, one is an evaluation of 24 persuasive technologies and two are suggestions for extensions of the method.

Process: What type of behavior change? On what schedule?

Behavior Wizard

Name on papers:

- Behavior Wizard: A Method for Matching Target Behaviors with Solutions (B. J. Fogg & Hreha, 2010)

Description: The Behavior Wizard is a method meant to specify types of behavior targets and matching them with solutions that fit. The method is built upon Fogg's Behavior Grid. The grid specifies 15 kinds of behavior change types, depending on how long the behavior should be changed and what type of behavior change that should happen. In order to use the Behavior Wizard, the designers need to label the behavior type, which through the Resource Guide helps the designers to find which papers and theories they should be inspired by, and therefore what persuasion techniques they can use.

Process: Clarify the Target behavior, Identify what triggers the behavior, Use the Research Guide to identify concepts and solutions related to the target behavior.

Design With Intent

Name on paper:

- Influencing Interaction: Development of the Design with Intent Method (Lockton, Harrison, Holley, & Stanton, 2009)
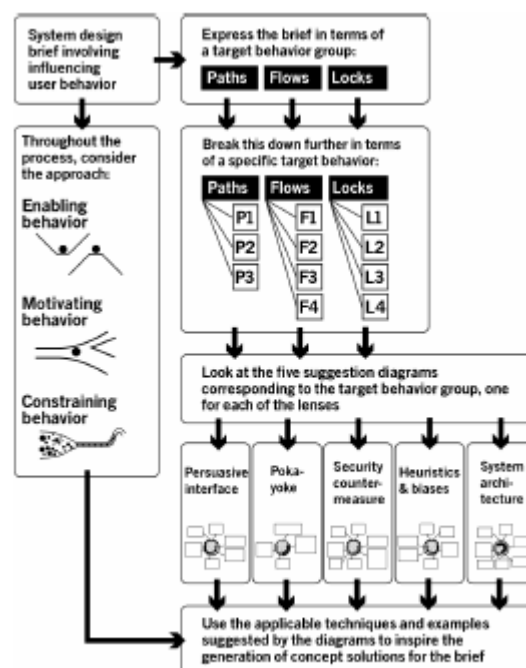
Figure 2. Structure of the DwI Method v.0.8

Figure 6 - Design With Intent Process

Description: The Design with Intent method is first introduced within the field in 2008 and is described in detail in 2009 (Figure 6). The method aims to explain how to find the right way to apply persuasion to influence behavior, also for those that are not within academia. The method groups design techniques into five different lenses, to enable designers to think outside their

immediate frame of reference. For each lens, a group of cards are given, that are meant to inspire the designers. The wording on the cards is designed to cause reflections of the choices.

Process: Persuasive interface, Poka yoke, Security countermeasure, Heuristics and biases, System architecture

EDIE

Name on paper:

- The EDIE Method – Towards an Approach to Collaboration-Based Persuasive Design (Gram-Hansen, 2016)

Figure 7 - EDIE

Description: The EDIE method is an iterative process for developing, testing, evaluating and refining design solutions (Figure 7). It is a collaboration-based persuasive design method, with four phases: Explore, Design, Implement, Evaluate. As it is visualized in the figure above, the method is made to create coherence between the human–centered approach and the system-centered approach. The method is intended to provide direction for designers to include both perspectives in a design process, so they are not only focusing on one perspective – but how the two perspectives influence each other.

Process: Evaluate, Implement, Design, Explore

Fogg Behavior Model

Name on paper:

- A Behavior Model for Persuasive Design (Bj Fogg, 2009)
- Successful Persuasive Technology for Behavior Reduction: Mapping to Fogg's Gray Behavior Grid (S. S. Ferebee, 2010)
- Does Trigger Location Matter? The influence of Localization and Motivation on the Persuasiveness of Mobile Purchase Recommendations (Basten, Ham, Midden, Gamberini, & Spagnolli, 2015)
- Improving the Design of Online Applications for Social Benefit through a Behaviour Change Model (Gough & Hamilton, 2013)
- Sustainability in the Workplace: Nine Intervention Techniques for Behavior Change (Yun, Scupelli, Aziz, & Loftness, 2013)
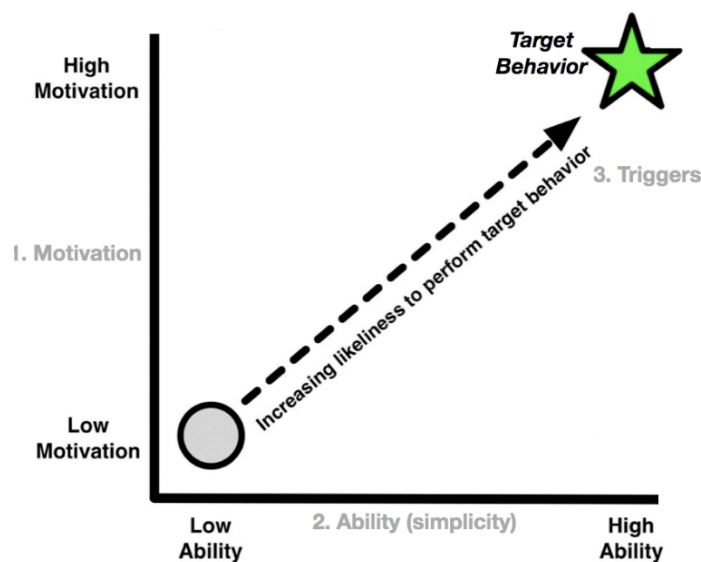

Figure 8 - Fogg Behavior Model

Description: The Fogg Behavior Model (Figure 8) can be used as a tool to identify and define three factors that help control whether a behavior is performed. It can be used to study technologies from e.g. health, education, sales, and help to get an inside knowledge about the factors that drive human behavior. This knowledge helps designers to not make guesses while making a solution and instead gives them a systematic way to approach the problem.

The three factors the model consists of are *Motivation*, *Ability* and *Triggers*. In order to make a target behavior occur it is necessary that a person has sufficient motivation and ability and an effective trigger. It is important that all three factors correspond for the behavior to happen.

Process: Motivation, Ability, Triggers

Fogg's Eight-Step Design Process

Name on paper:

- Creating Persuasive Technologies: An Eight-Step Design Process (BJ Fogg, 2009a)
- Informing Design of Suggestion and Self-Monitoring Tools through Participatory Experience Prototypes (Daskalova et al., 2014)
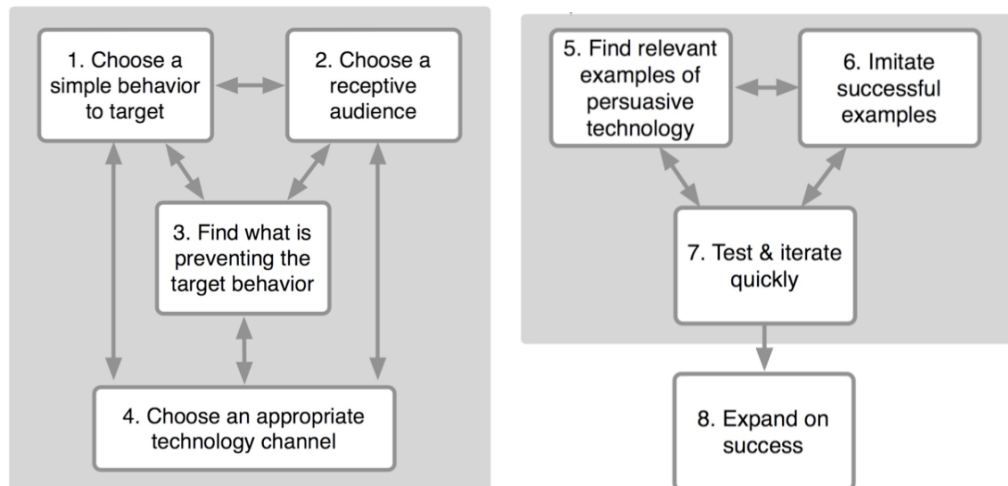

Figure 9 - Fogg's Eight-Step Design Process

Description: The Eight-Step Design Process is a method used to design persuasive technologies (Figure 9). The model above shows how the eight steps are working together. Some of the steps can be conducted parallel to each other, while some stand alone. Even though the model is showing how the process is going forward, sometimes the designer needs to go back and re-think earlier steps in the process.

The first step in the process is choosing the appropriate, smallest and simplest behavior to target for change. The second step is to choose the right audience. The third step is to investigate why the audience cannot perform the target behavior at this point. The fourth step is choosing the right channel for the technology for the change, which cannot be chosen if one has not made the first three steps. The fifth step is to find relevant and current examples of technologies, which are similar to the one that needs to be designed. The sixth step is to go through the examples from step five and see which ones are successful and why. The seventh step is to test these examples and other persuasive experiences – quickly and repeatedly. Finally the eighth step is where the designer gathers all the knowledge from the previous steps and creates a persuasive technology that changes a behavior.

Process: Choose a simple behavior to target, Choose a receptive audience, Find what is preventing the target behavior, Choose an appropriate technology channel, Find relevant examples of persuasive technology, Imitate successful examples, Test & iterate quickly, Expand on success

Functional Triad

Name on papers:

- Promoting Physical Activity Through Internet: A Persuasive Technology View (Zhu, 2007)
- Toward a Systematic Understanding of Suggestion Tactics in Persuasive Technologies (Andrew, Borriello, & Fogarty, 2007)
- Distributed User Experience in Persuasive Technology Environments (Segerståhl & Oinas-Kukkonen, 2007)

Description: As mentioned in the previous section, The Functional Triad by Fogg is one of the main aspects of captology. This method is also found during our literature review and is therefore described again. The method defines three persuasive functions: Tools - reduction, tunneling, tailoring, Intervening, Self-monitoring, surveillance, Conditioning, Media/Simulation - Cause and effect, environment and object and Social Actors - physical cues, psychological cure, influencing through language, social dynamic, adopting social roles, social cues/handle with care. Each of these functions has an influence on how a system can be persuasive. As a method it is used to evaluate to what degree systems use all of these functions - or just some. In one paper the functions are used to code data. However, as it is a short paper, the actual triad is not described. In the two others, only the seven tools are used, in which they are called strategies for persuasion. Here they are used to evaluate persuasive technologies.

Process: Tools, Media/simulation, Social actors

General Persuasion System

Name on paper:

- Designing Effective Persuasive Systems Utilizing the Power of Entanglement: Communication Channel, Strategy and Affect (Li & Chatterjee, 2010)
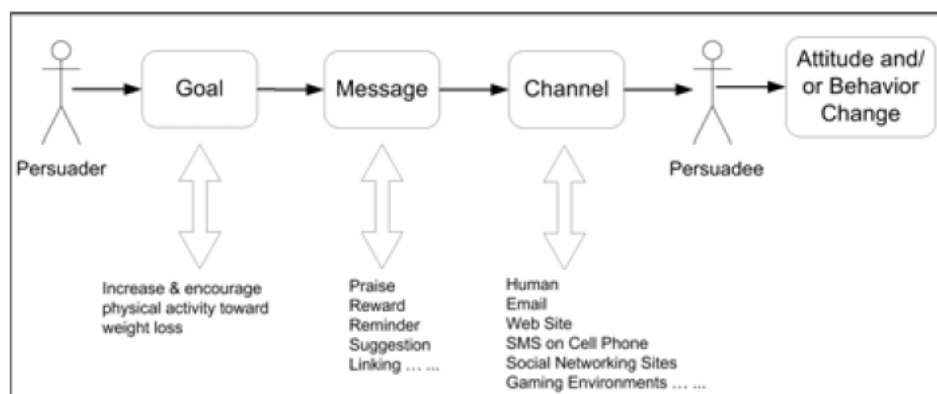

Figure 10 - The General Persuasion System

Description: The General Persuasion System (Figure 10) is a method for designing persuasive systems, created based on a literature review. This method consists of a persuader, which sets a goal for the persuasion. They then deliver this through a message using a different number of strategies, which will get to the persuadee through a communication channel. In the method, four main message strategies are adapted: praise, reward, reminder and suggestion. The channel can be anything from other humans to SMS or Social Networking Sites. The paper that proposes the method further includes user experience as a mediating factor for persuasiveness.

Process: Persuader, Goal, Message, Channel, Persuadee

Influence components model

Name on paper:

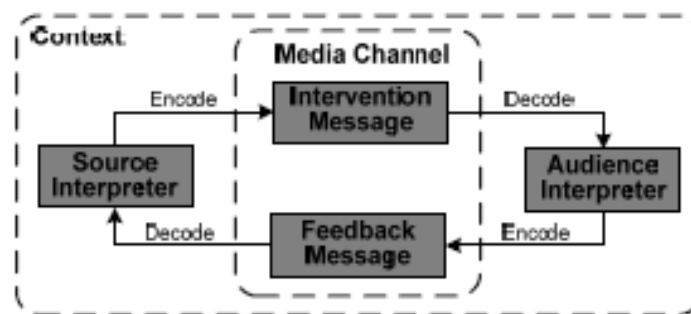- Communication-Based Influence Components Model (Cugelman, Thelwall, & Dawes, 2009)

Figure 11 - Influence Components Model

Description: The communication-based Influence Components Model (Figure 11) is created to account for both one and two sided communication. It can describe both interpersonal and mass media communication. The model is used to analyze behavior interventions, through the different components of the model. The actual persuasion will occur in the two messages within a media channel and when using this model, the designer must consider how all components are represented in the communication. The components to consider are: the *Context*, which is the factors that impact a system. The *Source interpreter* encodes the *Intervention Message* that is sent out and interprets feedback if this is given. The *Media Channel* is the way the messages are presented with different forms of media having different effects. The intervention message is the actual communication designed to impact behavior. The *Audience Interpreter* is the one targeted for the behavior change. Finally, the *Feedback Message* is what the audience interpreter sends back to the source, in order to adapt. This model was used to evaluate and analyze interventions.

Process: Context, Media Channel, Source Interpreter, Intervention Message, Audience Interpreter, Feedback Message

Inspiration Card Workshop

Name on paper:

- Generating Directions for Persuasive Technology Design with the Inspiration Card Workshop (Davis, 2010)

Description: Within the field of participatory design, Janet Davis proposes the Inspiration Card Workshop as a specific participatory method to support persuasion. The method is intended to ensure that themes of ethics, autonomy and consent have been considered in a design process. The method starts by interviewing participants about goals, hopes and concerns for the system, as well as performing observations. Afterwards, a package of materials is made, that participants can reflect on and complete when they have the time. The actual workshop consists of a number of cards, divided into domain cards and technology cards - but all inspired by the previous research - that participants and designers should combine to create new designs together.

Process: Explore the space (ethnographically inspired field methods), Workshop (present cards, combination and co-creation phase)

Participatory Design

Name on papers:

- Design Methods for Ethical Persuasive Computing (Davis, 2009)
- Generating Directions for Persuasive Technology Design with the Inspiration Card Workshop (Davis, 2010)

Description: Participatory design is a collection of methods in which the end-users are fully involved in the design process. Janet Davis proposes that this approach can address challenges of designing persuasive technologies. By including the user in the design process, participatory design helps the designer to gain more knowledge about the context for technology use. This can help to avoid potentially ethical issues before they appear. When using this approach it can also have an influence on the intent of the design, as it will be coming from a community itself, who wishes to make a change. The participatory design processes present in the cases Davis presents, are those with a focus on generating artifacts where the actual users do the designing.

Process: Varies from case to case, but always with a focus on enabling the users to generate designs

Persuasive Potential Questionnaire

Name on paper:

- The Persuasive Potential Questionnaire (PPQ): Challenges, Drawbacks, and Lessons Learned (Alexander Meschtscherjakov, Gärtner, Mirnig, Rödel, & Tscheligi, 2016)

Description: The goal with the Persuasive Potential Questionnaire is to measure the potential persuasive effect of a system. The Persuasive Potential Questionnaire is intended to be quickly applicable, easy to use for researchers and systems users and yet still open enough to be used for all kinds of systems. The questionnaire considers three dimensions in which you can measure potential persuasiveness: *Susceptibility to persuasion* – how likely a user is persuaded, *General Persuasive Potential of the System* – how likely any user is to get persuaded, and *Individual Persuasive Potential* – the impact the system has on a single user.

Process: Susceptibility to persuasion, General Persuasive Potential of the System, Individual Persuasive Potential

Persuasive System Design model

Name on paper:

- A Systematic Framework for Designing and Evaluating Persuasive Systems (Oinas-Kukkonen & Harjumaa, 2008)
- Analyzing the Persuasion Context of the Persuasive Systems Design Model with the 3D-RAB Model (Wiafe, Alhammad, Nakata, & Gulliver, 2012)
- Comparative Analysis of Recognition and Competition as Features of Social Influence Using Twitter (Stibe & Oinas-Kukkonen, 2012)
- Less Fizzy Drinks – A multi-method Study of Persuasive Reminders (Langrial & Oinas-Kukkonen, 2012)
- Towards Persuasive Technology for Software Development Environments – An Empirical Study (Pribik & Felfernig, 2012)
- Identifying Persuasive Qualities of Decentralized Peer-to-Peer Online Social Networks in Public Health (Myneni, Iyengar, Cobb, & Cohen, 2016)
- Embedded Disruption – Facilitation Responsible Gambling with Persuasive Systems Design (Warren, Parush, Wohl, & Kim, 2014)
- A System's Self-referential Persuasion – Understanding the Role of Persuasive User Experience in Committing Social Web Users (Oduor & Oinas-Kukkonen, 2015)
- Involvement as a Working Mechanism for Persuasive Technology (Kelders, 2015)
- Persuasive Information Security-Techniques to Help Employees Protect Organizational Information Security (Busch, Patil, Regal, Hochleitner, & Tscheligi, 2016)
- Persuasive Patterns in Q&A Social Networks (Adaji & Vassileva, 2016)
- "Don't Say That!" A Survey of Persuasive Systems in the Wild (Twersky & Davis, 2017)

- Commitment Devices as Behavior Change Support Systems – A study of Users' Perceived Competence and Continuance Intention (Oduor & Oinas-Kukkonen, 2017)
- Perceived Effectiveness, Credibility and Continuance Intention in E-commerce – A study of Amazon (Adaji & Vassileva, 2017)
- Behavior Change Support Systems: A Research Model and Agenda (Oinas-Kukkonen, 2010)
- Incremental Persuasion through Microblogging: A Survey of Twitter Users in Latvia (Stibe et al., 2011)
- Persuasive Features in Six Weight Loss Websites: A Qualitative Evaluation (Lehto & Oinas-Kukkonen, 2010)
- Pitfalls in Persuasion: How Do Users Experience Persuasive Techniques in a Web Service? (Segerståhl, Kotro, & Väänänen-Vainio-Mattila, 2010)
- Practical Findings from Applying the PSD Model for Evaluating Software Design Specifications (Räisänen et al., 2010)
- Technology and Adherence in Web-based Interventions for Weight Control: a Systematic Review (Kelders, Kok, & Gemert-Pijnen, 2011)
- Understanding Persuasive Software Functionality in Practice: A Field Trial of Polar FT60 (Harjumaa et al., 2009)

Description: The Persuasive System Design model is a theoretical framework for designing and evaluating persuasive technologies. It consists of a number of requirement specifications that is one of the most central phases in software development. These requirements are descriptions of how the system should behave functionally and what qualities it must have. The requirements can also be called system features or design principles. In this framework they are categorized as *Primary Task-*, *Dialogue-*, *System Credibility-* and *Social support.*

The design principles in the category primary task support, are about the user's primary task using the system. The design principles in the category dialogue support are about how to support users to keep moving towards their target behavior through computer-human dialogue. The design principles in the category system credibility support, is how to design a system so it is trustworthy and more persuasive. Finally, the design principles in the category social support are about how the system motivates the users by incorporating social influence.

Process: Primary task support, Dialogue support, System credibility support, Social support

Value Sensitive Design

Name on paper:

- Design Methods for Ethical Persuasive Computing (Davis, 2009)

Description: Janet Davis proposes the use of Value Sensitive Design, to ensure that any persuasive system is designed with ethics in focus. The key features of Value Sensitive Design are the

interactional perspective, attention to both direct and indirect stakeholders and a tripartite methodology - meaning that it incorporates *Conceptual*, *Technical* and *Empirical* investigations. This should be done iteratively and integrated in the process. This methodology has focus on providing methods for value and stakeholder analysis, especially for the indirect stakeholders and considerations of value scenarios.

Process: Conceptual investigation, technical investigation, empirical investigations

Based on this appraisal process, we have identified what literature we will consider in the following parts of the literature review. We have found the general methods of the field, which we will continue analyzing to get a further understanding of their characteristics. Following the appraisal step, we continue to synthesize the identified methods.

3.4 Synthesis – Understanding the methods

In the following section, we first describe the theoretical foundation of the synthesis process an how we approach it. We then consider the methods identified during the appraisal, in relation to the Research Design Landscape (Sanders, 2008), which will also be described.

For the synthesis process in a literature review we need to consider the literature that is deemed relevant in more detail. This means, looking for patterns and directions in the findings. It is not the actual analysis of the literature, as the synthesis process is merely about examining what the literature states and how they describe themselves in relation to each other. It is not about interpreting what the literature might mean or start considering why they might mean something (Booth et al., 2012).

To structure this process, we have decided to use the Research Design Landscape (Sanders, 2008). This is done in order to get an understanding of how the different methods approach the challenge of designing and evaluating persuasive technologies.

3.4.1 The Research Design Landscape

When conducting research there are many ways to do so. In an attempt to identify the various ways of doing design research, Liz Sanders looks at the design research space as a landscape. She proposes a visualization of how the different approaches are placed compared to each other (Sanders, 2008). The landscape is created as a tool to support discussion of the different approaches. She asks for others to add in more clusters and considerations, so the landscape can evolve along with the fields. The newest version of the landscape is illustrated in *Figure 12*.
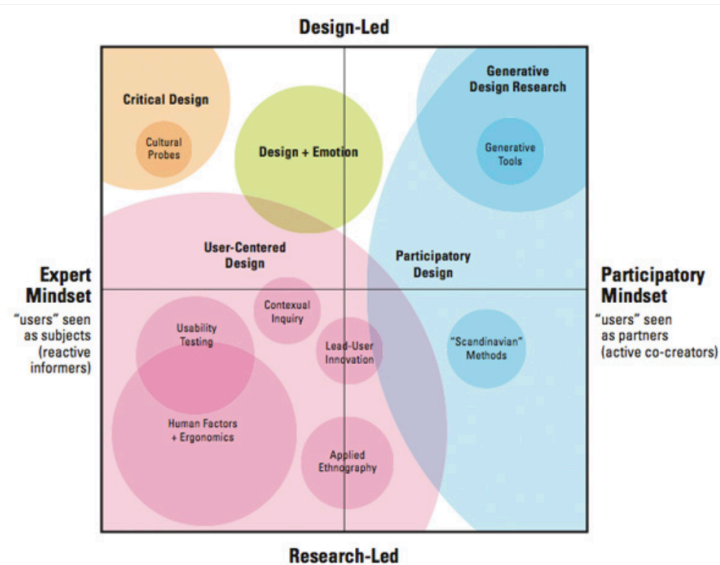
Figure 12 - Sanders Research Design Landscape (Sanders, 2008)

The landscape has two dimensions dividing the research approaches. The first axis divides the map into the fields that have an expert-oriented mindset (left) or a participatory mindset (right), when they practice design research. In the expert-oriented mindset the researcher is an expert who researches subjects or informers. On the other side for the participatory mindset, researchers consider the users the experts and invite them into the design process as equal partners or co-creators.

The second dimension divides the landscape into research-led approaches in the bottom, where there are methods that are influenced more by the research, compared to the design-led approaches at the top, which focus more on the design.

Within this landscape, there are different zones and bubbles. The main areas are *Critical Design, Design + Emotion, Generative Design Research, Participatory Design* and *User-Centered Design.* The User-Centered Design area is the biggest area placed between research-led and the expert mindset, followed by the Participatory Design area, which is both, placed in the research-led and design-led dimension, but in the participatory mindset (Sander, 2008).

The User-Centered Design was in the beginning mostly used in the US and was for many years the primary design approach. The designers in this area are working from a research point of view with the experts in focus. The participatory approach on the other hand, is a Northern European approach, where the designers are working in the participatory area and attempts to actively involve the users (Sanders & Stappers, 2008).

Each of these areas has further clusters of design research activity, with their own focus and characteristics for how to conduct design research. The placement of these clusters and how they might move during the years, are what makes this landscape interesting for Sanders. It has furthermore been used in teaching and as a tool to understand how ones background influences the research designers conduct and new approaches a designer might take.

3.4.2 Placing the methods on the landscape

We include the most recent version of the landscape into our research, not to plot more clusters into it or to suggest new placement of the existing clusters, but to use the landscape and its dimensions to place methods within the already existing clusters. We do this to structure the way we look for similarities in the design approaches used within the field of persuasion. By placing the methods in the landscape, we are able see if there are approaches that are more dominant than others. We therefore use the landscape as a way to structure the consideration of the identified methods, in accordance with the synthesis process of the literature review.

We are aware that some of the general methods we are considering have only been used for evaluation of technologies, but we will plot the method into the map anyway, as if the evaluation had been a design process. We do this because the evaluation methods also assess whether a persuasive design is working and can therefore still bring valuable insight to our thesis.

When adding the different methods onto the map, we consider the already identified design approaches and how they relate to the methods we have identified. To decide where to place each method, we use the descriptions in the papers where it appears, as well as any cases where it has actually been used. We look for pointers that can place the method in the most accurate way. This means, that even if the method is well established outside the field of persuasion, we only focus on how it is used *within* the field and add the approach accordingly. However, as much as we aim to be precise while adding the methods onto the map, the exact placement, or whether it should be slightly more towards one dimension than another, is up to interpretation. We are only using the landscape to look for general patterns in this section and a more in-depth analysis of the differences between the methods do not belong in this part of the review. The final placement of the methods is illustrated in Figure 13.

1. Appeal Belonging Commitment
2. Behavior Change Wheel
3. Behavior Grid
4. Behavior Wizard
5. Design With Intent
6. EDIE
7. Fogg Behavior Model
8. Fogg's Eight-Step Design Process
9. Fogg's Functional Triad
10. General Persuasion System
11. Influence components model
12. Inspiration Card Workshop
13. Persuasive Potential Questionnaire
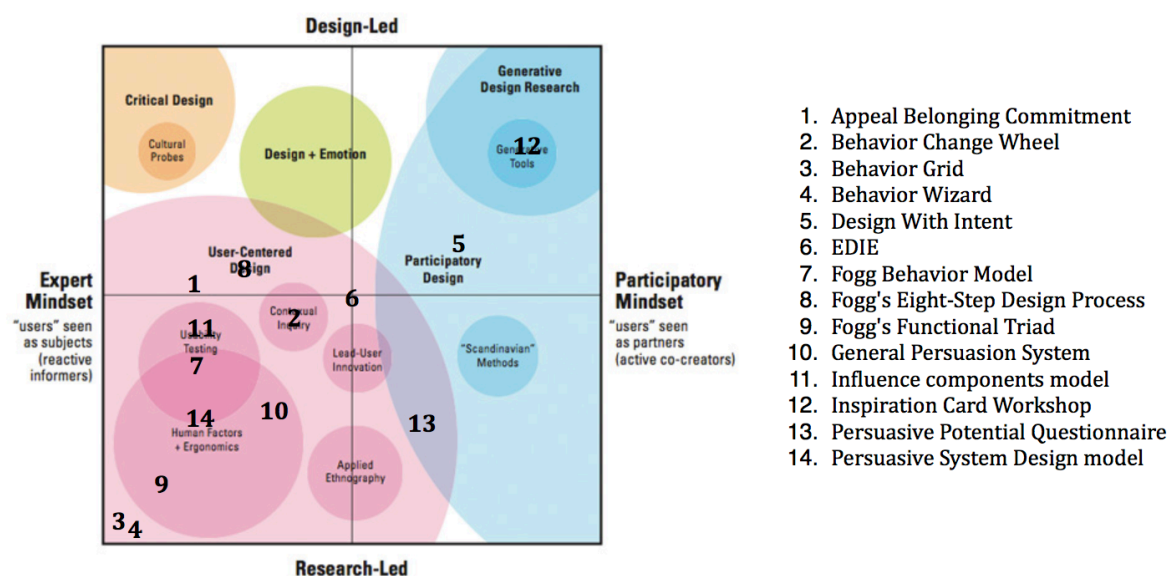14. Persuasive System Design model

Figure 13 - Placement of methods

When going through the identified list of methods, we find that two of the methods, Participatory Design and Value Sensitive Design, can not exactly be placed on the map, as they are more general approaches than methods with steps or a process. We therefore decide to exclude these two from the analysis, as they will not support us in examining our research question. Instead we continue to focus on methods with clear descriptions of which process a designer needs to go through to use it.

To organize the arguments for the placement of the methods on the map, we divide this section into the four quadrants of the map: *Expertly design-led*, *Participatory design-led*, *Expertly research-led* and finally *Participatory research-led*.

3.4.3 Expertly design-led

Within this quadrant of the map, fields like critical design, cultural probe and design + emotion are placed. It also includes the top of the user-centered design field. These approaches have a focus on the design itself and are generally created by experts considering users as informants for the design and not co-creators. We place two methods within this quadrant.

Fogg's Eight-Step Design Process
This method focuses on iteration through the design, which places it closer to the design-led approach than research-led. However, the design is created by experts who merely evaluate the users, which places it within the user-centered design field.

Appeal Belonging Commitment
This method is used by designers, which places it towards the expert mindset. It is also placed close to the middle between the design-led and research-led approaches. This is because they use the framework for designing, but still has a focus on researching about how to do the design before starting the process. This method is not explicitly one approach more than the other and this is the reason for its placement.

3.4.4 Participatory design-led

The participatory design-led quadrant consists of participatory design, generative design research and generative tools. This approach also focus on the actual design rather than research, but consider the end users as partners and includes them in the process. We place three methods within this quadrant.

Inspiration Card Workshop
The Inspiration Card Workshop is a method that is not just used within the field of persuasion, but we focus on how it is presented in the literature. The way it is used within persuasive design

is with a focus on being generative while working closely with the users. The users use cards to generate designs, which is why this method has been placed within the bubble of generative tools, rather than the general generative design research bubble.

EDIE

This approach does not really belong to only one quadrant, which is why it is placed in the middle of the map. This is because the purpose of the design method is to bridge the different approaches by allowing both approaches and mindsets. However, we describe the method within this quadrant as its use in the literature is with a focus on collaborating with the users.

Design With Intent

The way this method approaches design is through the discussion created by a number of cards in five different categories. At the same time, it is intended to be used by non-experts. This is the reason we have placed it towards the participatory mindset. It is placed a little closer to the design-led approach than the research-led, because these cards and the possible combinations of them is the focus of the method.

3.4.5 Expertly research-led

In this quadrant, the experts are creating the designs, which is possible when the users only work as informers, without being included in the actual design process. With this approach the design is influenced by research rather than the design itself. We place 8 methods within this quadrant, which is the highest concentration of methods on the landscape.

Influence Components Model

When describing how to use this method, there is no focus on including the users in the process, which place it towards the expert mindset. The focus of the method is also based on research rather than on the design. It is placed within the overlap between the approaches usability testing and human factors + ergonomics, because the method focuses on these elements of the system.

Behavior Change Wheel

This model is used as a way of understanding information gathered through interviews, to consider how a system is persuasive. This fits with the characteristics of the already placed Contextual Inquiry bubble, which explains its placement.

General Persuasion System

This method is used by experts to evaluate how a design influences a persuadee. Users are involved, but as subjects testing a system based on factors decided by the experts and current theories. This is why it is expert-led and research-led within the bubble of human factors + ergonomics.

Fogg Behavior Model

With a focus on the user as someone you need to observe, in order to look at how they react to certain environments, we have placed this method close to the expert mindset. We furthermore place it towards the research-led approach, as it aims to understand users through research. We consider the most appropriate placement to be within the bubble for human factors + ergonomics.

Fogg's Functional Triad

This method is expert-led as it is only used by experts and considers the users as subjects. It also belongs within the bubble of human factors + ergonomics. It is toward the research-led approach, as you need to understand the strategies and the theory behind it, in order to apply the method.

Behavior Grid

This method is placed close to the corner of the quadrant towards an expert mindset because it is used not *with* the users, but with them as subjects that just react to input. The design process is also research-led as the elements of the design are based on previous research and generating the design.

Persuasive System Design model

This method is expert-led, as you need expertise within persuasion to use the model. At the same time, it is very research-led as it is based on theory rather than the designs, which place the method within the human factor + ergonomics bubble.

Behavior wizard

This method is a further development of the Behavior Grid and is therefore placed very similarly. With a focus on literature guiding the design, this method is research-led with experts making decisions on how the design should be, leaving it within the expert mindset.

3.4.6 Participatory research-led

The approaches that belong in the last quadrant are those in which the participants are considered active co-creators of the design, with a focus on research rather than the design itself. Within this quadrant the participatory methodology belongs with a focus of what Sanders considers the *Scandinavian* methods. We place one method within this quadrant.

Persuasive Potential Questionnaire

This method aims to include the user in the evaluation process, as they know their experience the best, which place them towards the participatory mindset. However, it is still place within the user-centered bubble, as their feedback is evaluated by experts, who make the decisions in

the end. It leans toward research-led, as it does not focus on the actual design elements in the evaluation.

After mapping the methods into approaches, it becomes clear that most of the methods belong within the expertly research-led mindset with eight out of the 14 methods placed here. The methods are in general also research-led, with only one placed close toward the design-led dimension and three or arguably only two placed closer to the participatory mindset. It is clear that there is a preference within the field of persuasion, when it comes to which design approach is used.

By having characterized each method and looked into where on Sanders landscape they are placed, we now have a better understanding of the methods used within the field of persuasion. But to get a better understanding of the characteristics of each method and how they compare to each other, we first need to get a clear understanding of what we expect to be included in a method like this. We therefore need to take a step back and consider the theoretical framework of persuasion and information architecture, to generate a framework for comparing the methods belonging to the different approaches.

4 Theoretical definition of persuasive design methods

To create the framework necessary to analyze the identified methods and their placement on the landscape, we focus on two things: First, we need to define our understanding of persuasion and the implications this will have for a design and evaluation method. Secondly, we will explain why we believe information architecture is an approach that can contribute to a persuasive technology. The results from this will be the foundation of the further analysis of the identified methods.

4.1 Defining persuasion

In this section we describe our approach to the field of persuasive technology. The perspectives included is an elaboration of the theory presented in *What Makes It Persuasive?* (Gram-Hansen et al., 2018). This is the research that started our interest within this field and it is the background for this thesis and its research question. The purpose of this section is to clarify how we define persuasion. This is necessary to do, as the previous literature review has shown that there are many different ways in which to design persuasive technologies. By defining how we understand persuasion, we are able to place ourselves within the field and create a framework that can support a further analysis of the identified methods. As the background of the field has already been described in section 3.1, this section will focus on the response to Fogg's perspectives and further definition of persuasion. We continue to consider how this influences the characteristics of persuasive technologies and how such technologies are designed.

Not everyone immediately agreed with Fogg's approach to defining the field and his creation of the functional triad. An example of this is *Captology: A critical review* (Atkinson, 2006), which was presented at the very first conference for Persuasive Technology, and therefore has set the tone for the research done following it. We include this paper to show some of the criticism captology was met with, as the response to Fogg's perspectives is just as important for understanding the history of the field, as the perspectives themselves.

Beyond her own review, Atkinson includes the considerations of two other reviews in her paper (Atkinson, 2006). While the reviews do find the framework and ideas that Fogg describes valuable, there are a number of areas in which they believe it can or should be improved. The cri-

tiques are primarily within three themes, namely the categorization of the functional triad, the ethical omissions of the field and the lack of a clear definition of what is considered persuasion.

When considering the categorization of the Functional Triad, the reviewers note that it itself is a useful concept which can be used as a tool to create designs. The criticism is mainly focused on the way in the tool is presented, as it can create confusion and lead to misuse of the triad.

When considering the first function – tools – Atkinson calls for a clarification of who it is a tool for – the designer or the user of the technology. She believes it to be more of a tool for the designer to persuade the user into a specific behavior or attitude, but argues that this needs to be more apparent in the text to avoid misinterpretations.

For the element media, she raises the question if all types of technology are not always a medium for communication - persuasive or not. The criticism is therefore that the name does not describe it's content clearly enough. Instead, the word *simulation* is suggested, as a term that more accurately describes the examples of the function.

Finally, for the functional element social actors, Atkinson raises an issue with Fogg's assumption that computers can be social entities.

"*Machines are not 'socializable' because they are not social creatures; they are not fellow human beings*" (Atkinson, 2006, p. 175).

Computers are not actually reacting and communicating like humans and it is only *like* a social interaction. The risk with considering computers as social actors within persuasion is that one might forget that the persuasion is not coming from the technology itself, but from the designer behind it.

If we relate the fact that Fogg intents this triad to be a support for designers who are not experts within the field of persuasion, with the concerns that Atkinson raises, a potential issue becomes apparent. As seen in our previous review of the existing methods for persuasive design, we identified three papers using the triad as a general method. However, we also found 12 other papers, excluding Atkinsons review (Adaji & Vassileva, 2016; Clinkenbeard et al., 2014; S. Ferebee & Davis, 2012; Firpo, Kasemvilas, Ractham, & Zhang, 2009; Harjumaa et al., 2009; Kelders, 2015; Miranda et al., 2013; Oinas-Kukkonen & Harjumaa, 2008; Revelle, Reardon, Green, Betancourt, & Kotler, 2007; Sundar, Bellur, & Jia, 2012; Zhang-Kennedy, Chiasson, & Biddle, 2014; Zhu, 2007). If how to understand or use the triad can be interpreted in different ways, then it raises the question if all of these papers use it the same way. One of the papers using the Functional Triad is called *A Systematic Framework for Designing and Evaluating Persuasive Systems* (Oinas-Kukkonen & Harjumaa, 2008). This is also the paper that presents the Persuasive System Design model, which we have identified as the most used method for designing and evaluating persuasive technologies. The concerns raised in this critical review, might in other words have implications for the results that people are getting using the Persuasive System Design model, and whether or not the conclusions they reach are related to true persuasion or suffer from misinterpretations. This shows that any method, which is meant to be used by a

non-expert, needs to be considerate in the way it explains the concepts to avoid misunderstandings.

The second concern Atkinson raises with captology, is the omissions of an elaborated discussion of ethical considerations. Fogg writes that captology is only concerned with the intent that a designer adds to a design and not the outcome of the use of the technology. However, it is considered a great oversight in the field not to consider all possible consequences and to not take the user more into account during the process:

“*Philosophical, theoretical, ethical frameworks and established moral codes provide us with guides to minimise harmful consequences*” (Atkinson, 2006, p. 176)

By adding user tests and inclusion of users into the process, it can help the designer to consider and minimize unwanted scenarios. Another concern is, if the use of a technology to persuade can ever be an ethical or non-manipulative way of changing others behavior. To ensure this, Atkinson argues that the persuadee should always be aware that they are being persuaded and what they are persuaded into. In other words, the intent of the designer needs to be clear before a user chooses to interact with the technology - as an ethical safeguard.

The last critique appears due to a lack of a longer discussion of what it means to be persuasive. Depending on how you consider persuasion, it changes the characteristics for technologies and how to design them.

An attempt to define persuasion and the implications of the definition has been made by Spahn (2012), who uses the framework of discourse analysis to consider persuasive technology from different perspectives. He is able to do so, as he considers using persuasive technologies a form of communication. He identifies three guidelines for design and usage of persuasive technologies. These perspectives are included underneath, as it is a more detailed consideration of how the definition of persuasion influences persuasive design. The three guidelines are:

- G1: Persuasion should be based on prior (real or counterfactual) consent.
- G2: Ideally the aim of persuasion should be to end the persuasion.
- G3: Persuasion should grant as much autonomy as possible to the user

(Spahn, 2012)

The first guideline is much like Atkinson's concern about transparency, a theme that her and Spahn are not the only ones to include when considering persuasion. A number of other papers also include considerations of transparency: (Algashami et al., 2017; Beun et al., 2016; Davis, 2009; Dolata, Comes, Schenk, & Schwabe, 2016; Duncan, Camp, & Hazelwood, 2009; Heras, Rodrıguez, Palanca, Duque, & Julian, 2017; Karppinen & Oinas-Kukkonen, 2013; Mustaquim & Nyström, 2015; O'Brien, Alfano, & Magnusson, 2007; Oinas-Kukkonen, 2010; Timmer, Kool, & Est, 2015; Zapico, Turpeinen, & Brandt, 2009). The aim of Spahn's guideline is to minimize asymmetry of the situation, by ensuring that a subject has agreed to be persuaded in some form.

This means, that when doing persuasive design you must focus on making sure that there is informed consent, to limit the risk of moving into a more manipulative type of behavior change.

The second guideline relates to the purpose of persuasion. Where the previous definition focuses on persuasion as something to change attitudes and behaviors, this definition adds the idea of what will happen when the persuasion is done. If a designer designs a technology to support certain behaviors and attitudes, they might make someone dependent on it. But if an attitude is truly changed, it will no longer be necessary to persuade someone to keep up the attitude or the intended behavior change. The users of the technology should be able to have the attitudes and behaviors, even when the technology is not present. To do this, Spahn proposes including more of a learning effect into the design process.

In the third guideline, Spahn describes how each user needs autonomy in the process. During our literature review, we found a great number of others who also consider the need for the user to be in control to be important (Bang, Gustafsson, & Katzeff, 2007; Beun et al., 2016; Burleson, Newman, & Brotman, 2012; Busch et al., 2016; Chow, Harrell, & Yan, 2015; Davis, 2009; Duncan et al., 2009; Fallman, 2007; Karppinen & Oinas-Kukkonen, 2013; Khaled, Fischer, Noble, & Biddle, 2008; Krischkowsky, Maurer, & Tscheligi, 2016; Lacroix, Saini, & Goris, 2009; Lallemand, Gronier, & Koenig, 2015; Oduor & Oinas-Kukkonen, 2017; Reitberger, Güldenpfennig, & Fitzpatrick, 2012; Reitberger, Kastenmiller, & Fitzpatrick, 2013; M. Roubroeks, Midden, & Ham, 2009; M. A. J. Roubroeks, Ham, & Midden, 2010; Scholten, Kelders, & Gemert-Pijnen, 2017; Smids, 2012; Sorri & Leinonen, 2008; Sundar et al., 2012; Timmer et al., 2015; Aagaard & Øhrstrøm, 2012). This guideline is highly related to the first guideline, as it is about giving the persuadee the power in the communication. In order to include this consideration in a technology and a design process, it is necessary to remember that it is up to the user themselves to decide, to what degree the technology should be persuading them. In the design process, it is necessary to consider scenarios in which a user might want to override the persuasion - or simply be persuaded to a lesser degree at other times.

4.1.1 Persuasion – a definition

To continue our work with persuasive technologies and how to design them, we need to be explicit with how we define persuasion and what implications this has for the remaining results in this thesis. At the same time we should avoid repeating the same mistakes, which have already been voiced within persuasion.

As previously mentioned, this discussion of persuasion is an elaboration of the research conducted in our previous paper (Gram-Hansen et al., 2018). As this research considers persuasion from the perspective of rhetoric, we want to elaborate on this perspective, rather than take a social psychological approach, which might be a more common approach. Looking at persuasion through the rhetorical perspective is not an entirely new approach. Fogg himself acknowledges classical rhetoric in his book, as the background of persuasion (B. J. Fogg, 2003). We believe that

going back in history can help define and understand what persuasive technologies should support today.

Persuasion as a concept has its roots in the classical rhetoric of ancient Greece. It was here considered the art of the beautiful speech - not just meaning communicating in a pleasing way, but also to be truthful, morally right and impactful (Lindhart, 2003). These considerations add a lot of conditions to the definition of persuasion, as being not just impactful but also focused on the truth and being morally right. In other words, persuasive technologies should not try to manipulate a behavior change or attitude.

To create the beautiful speech as believed in ancient Greece, there are five disciplines you need to take into consideration, here translated to modern terms:

- Invention - *Inventio*: The art of gathering the material needed for the speech
- Arrangement - *Dispositio*: The art of arranging the necessary material in the way that utilizes it best
- Styling - *Elocutio*: The art of expressing the thoughts that have been identified and arranged in the previous processes in the right way, with the correct words and metaphors
- Memorizing - *Memoria*: The art of remembering the material, so it can be presented in a way that shows that the speaker actually believes what they are saying
- Delivery - *Pronuntia/actio*: The art of actually presenting the speech, with focus on tone of voice and the gestures of the speaker

(Lindhart, 2003, p. 50-53)

These disciplines are meant for spoken communication due to the time they were defined. However, as previously argued the technologies are still trying to persuade through communication. While a computer cannot make gestures or inflections of a voice, some of these disciplines might still be useful to consider when designing technologies. It might not be a speech it delivers, but it is still meant to communicate an idea and persuade someone.

Beyond the disciplines that are necessary to deliver a beautiful speech, rhetoric is also concerned with finding the right moment to deliver it, described with the term *Kairos.* Kairos encompasses a moment in which you do not just say the right thing at the right time, but you also say it in the right way. When all three aspects is considered, it will be the appropriate or opportune moment for persuasion (Lindhart, 2003). Within the field of persuasion, Kairos has been introduced before, as a way to consider more carefully if the persuasion will be impactful or successful.

As mentioned before, classical rhetoric was not just about being impactful, but also truthful and morally right. However, none of the five described disciplines can be used solely for this purpose. Kairos and the disciplines might as well be applied to make a lie seem more like the truth. This will not be considered persuasion - but rather the term *peithenanke*, meaning force masked as persuasion, so that e.g. listeners of a speech think they are being persuaded, but instead they

are closer to being manipulated (Fafner, 1997). When considering true persuasive technologies it is therefore necessary, to try to avoid moving towards this type of behavior change, no matter how impactful it might be. A technology might be creating behavior change, but it will not be persuasion.

This importance in distinguishing persuasion from other forms of attitude and behavior change, is also found in Fogg's definition of persuasion:

"… An attempt to change attitudes or behaviors or both (without using coercion or deception)". (B. J. Fogg, 2003, p. 15)

But how can you ensure that you do not manipulate or force this change? Atkinson's considerations might help clarify the definition more precisely. Her review emphasizes that to persuade someone, the persuasion must not just be transparent, but the user should be willing to make the change they are being persuaded into. At the same time, a designer should also be more aware of all the possible consequences of the persuasion - intended or not.

With these considerations in mind, we can adapt Fogg's definition, into one reading:

Persuasion is an attempt to change attitude and/or behavior for a willing subject, while taking into account all possible consequences of the attempt.

The way you define persuasion affects how you consider persuasive technologies and how to design them. This definition of persuasion means, that for a technology to be truly persuasive and behavior and attitude changing in another way, a user must know what the technology is aiming to persuade them to do and they must agree to be persuaded by it. For the process of designing such a technology, it means to include careful considerations of the intent and possible outcome of the use of the technology. By adding the concept of *willing subject* the ethical safeguard proposed by Atkinson is therefore included. This means that not all technologies can be persuasive, even if they change e.g. behavior. By including the rhetoric approach to persuasion, we are also given five disciplines, which can be considered as suggestions for how to plan for persuasion, as well as the term Kairos, which can support when this persuasion should happen.

If we continue to consider our definition in relation to the three guidelines presented by Spahn, some aspects of them are already included. By emphasizing that a user must be *willing* before persuasion can occur, the first guideline is already considered in the definition. In regards to the last two criteria, the definition can be further adjusted to include the word *empower*. This is understood here as giving autonomy and control entirely to the user, rather than the designer or technology. By clarifying that it is the *user* that should be empowered, it is meant to explain that this should also be the case when they are away from the technology. Any dependability on the technology to sustain the change in the long term should make the designer question if they are working towards persuasion.

Based on these considerations of the field of persuasive technology, the definition of persuasion that we will use to guide this thesis, is as following:

Persuasion is an attempt to change attitude and/or behavior for a willing subject by empowering them, while taking into account the consequences of the action.

4.1.2 Implications for a design process

As the theory behind this field has been discussed and a clarification for how this thesis considers persuasion has been made, this section will summarize the findings and how it will influence any method meant to design persuasive technologies.

The previously presented considerations and definition can be summarized in the following six guidelines, which a possible design or evaluation process needs to include. The guidelines to consider for a process are:

- Consider all possible outcomes of the use of the technology
- Define what attitude and/or behavior it aims to change
- Consider if the subject of the persuasion is willing and how this is ensured
- Ensure that the persuasion empowers the user
- Consider when the appropriate moment for the persuasion occurs

These five guidelines are what we believe to be essential to consider before you are able to design or evaluate persuasive technologies. When we later in this thesis analyzing the identified methods, these guidelines are the characteristics for whether we consider them to be sufficiently persuasive or if they are possibly relying more on peithenanke.

4.2 Information architecture - an approach to persuasive design

As we have now defined persuasion, a question could be raised as to why we also want to include the approach of information architecture? In the following section we argue for information architecture's relationship with rhetoric and persuasion. We explain how to approach information architecture and the components that constitutes it, so it can be referenced later during the analysis of the identified methods.

Information architecture in its simplest form is about organizing information so it is easy to find for the user. As persuasion has its roots in rhetoric, we argue that so do information architecture.

Like the five disciplines in rhetoric are about performing the beautiful speech, so is information architecture about presenting information in the same beautiful way. This is why we believe adding this approach and framework for discussing information, can give value to the field of

persuasive design. A further discussion of the connection to classic rhetoric is presented after the description of information architecture.

When examining the aspects of information architecture it is worth mentioning Louis Rosenfeld, Peter Morville and Jorge Arango. In 1998 they wrote the book *Information Architecture – for the World Wide Web* which has since been published in four new editions. The book is one of the most popular within the field, since Rosenfeld, Morville and Arango gives a complete description of the different elements and components that are necessary to consider when working with information architecture (Burford, 2010).

To create a better understanding of how information architecture may influence persuasive design and show why these two fields can be connected, we have been using the newest edition called *Information Architecture – for the Web and Beyond* (Rosenfeld, Morville, & Arango, 2015). This book is our reference framework to describe the information ecology and the four components within the field of information architecture: *Organization*, *Labeling*, *Navigation* and *Search*. This is necessary in order to describe the language used to design information systems and how this framework can benefit the research in this thesis.

There are not many studies conducted about how information architecture and persuasive design can influence each other or work together. The paper *Persuasive design principles: means to improve the use of information organization and search features in web site information architecture?* (Lykke, 2009) considers how the principles from persuasive design can improve two of the components from information architecture. In the paper it is argued that the principles used within persuasion are already well known and well used within information architecture, but that the framework can be a useful tool if included in the implementation of information architecture.

Our literature review further showed that information architecture is a relatively unexplored area within the field of persuasion. Only nine of the 340 papers mention information architecture and only two of them mention it through the text and not only in a reference. One of these papers: *Categorization as Persuasion: Considering the Nature of the Mind* (Iversen & Pertou, 2008), is about the role categorization has within the field of persuasion. They explain:

"But as we have argued previously there has not yet been paid attention to how categorization can enhance persuasion instead of just enhancing usability." (Iversen & Pertou, 2008, p. 215)

It has therefore been mentioned before, that the combination of the two fields should be explored. However, this paper only focuses on one component of information architecture – not information architecture as a whole and its connection to persuasion.

Outside the field of persuasion, others have also argued that persuasion and information architecture should be considered as a pair, as they both involve more than the type of content and the sender's intention – they are both considering the users motivation and the context of the information (McCoy, 2000). This means, that connection have previously been made between

information architecture and persuasion, but we find it necessary to explore more in depth how they can benefit each other.

We do this by getting a better understanding of how information architecture is defined, which components it consists of and most importantly – how it can work together with persuasion. We therefore present the elements of information architecture, so that they can be referenced later in the analysis.

4.2.1 Defining information architecture

The main reason to consider and design information architecture is to make information findable and understandable. If a designer builds up information in the right way, it helps users to find what they are looking for, without getting lost or using an unnecessary amount of time finding the information. But since you cannot directly see a system's information architecture it is often forgotten or overlooked. It may be invisible to the eye – but that does not make it less important.

There is not a short way to define information architecture, because there are so many layers and elements to consider and many components that work together to create an information architecture. The user environment plays a major role for how the information architecture design should be. Different people can understand things in different ways. This means, the way the designer organizes and labels content, needs to cover everyone within the information environment – it is therefore important to consider not just what makes a good information architecture, but how to create one.

Even though it is difficult to make an exact definition of information architecture, it is possible to define what to consider in order to create effective information architecture design. A way to do this is by considering the information ecology.

Information Ecology

To make information findable and understandable to the users, the designer needs to consider the connection between the information and the users. To support this, Morville, Rosenfeld and Arango have made the *Information Ecology* (Morville & Rosenfeld, 2006)*.* The purpose of the information ecology is to structure what kind of knowledge it is necessary to gain, to create successful information architecture. The ecology consists of the three areas *User, Context* and *Content.* The ecology is illustrated in the form of a Venn diagram, as seen in Figure 14.
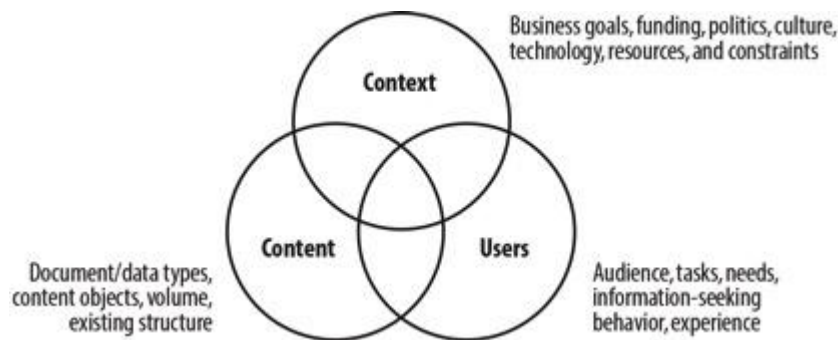
Figure 14 - Information ecology (Rosenfeld et al., 2015, p. 32)

The three areas are individual, but as Figure 14 illustrates, they should be influenced by each other to work together. There needs to be balance between the three areas in order to create good information architecture.

User

The user of an information system can vary depending on the type system in question. The users will always be the people using the system, so it can be visitors, customers, students etc. It is therefore always necessary to know who the intended users of the system are, how they are expected to use it and most importantly – what information they are expected to find through the system. If the user has trouble finding the information they need, they will look for it somewhere else.

Context

Every information system is a part of a specific context, which can both be expressed implicitly or explicitly. Every user has their own norms, which influence their use of a system, as well as expectations and capabilities. It is therefore important to consider the context the user finds themselves in, to ensure that the information system supports this.

Content

An information system consists of a lot of different content. This content can be products, pictures, data, videos etc. When it comes to content, the main focus is to make it findable to the users in order to get them the information they need.

When working with information architecture the information ecology is a tool, which can be used to make sure to consider the different areas of information architecture by taking the users, context and content into consideration. The information ecology should therefore, besides being used as a tool, be used as a mindset and framework when working with information. If done so, you make sure the users can find the information they are looking for in the right context.

This tool can add to our thesis as it specifies areas, which are necessary to consider in a design process to create good information architecture, also when designing persuasive technologies.

The ecology needs to be kept in mind, when considering the components of information architecture.

Information Architecture Components

As mentioned before the information architecture consists of four components: Organization systems, Labeling systems, Navigation systems and Search systems. Together the four components makes it possible to structure information, in order to get a successful information architecture, as long as the information ecology is considered for each component.

Organization systems

To present information in a system, the designer needs to organize the information in a way that makes sense to the users. This applies not only to information technology systems, but all kinds of systems. We organize information to understand, explain and control it. We also organize information so the user of the system can find what they are looking for in the right context.

Everyone is confronted with a lot of information every day and everyone has their own way of organizing content on their laptops, mobile phones, files etc. The challenge of organizing information is not new and people have struggled with it for centuries. So in order to design usable organization systems, it is necessary to be inspired by people's own interpretation of how content should be organized. There is not one system that fits all people. Designers therefore need to do user research to get a better understanding of how people organize their systems on their own – in order to organize a system that will fit as many people as possible.

When organizing systems the designer needs to consider the *Organization schemes* and *Organization structures* in order to make sure the information is organized according to the needs of the users*.*

Organization schemes

Everyone navigates through organization schemes every day without even noticing it, whether it is at the supermarkets or at the library. Organization schemes can vary in many ways - some are easy to use and some are more complex. The 'easy ones' are the *Exact Organization Schemes*, where the designer organizes information into mutually exclusive schemes – e.g. information organized alphabetically. There is no questioning the order of the alphabet. The Exact Organization Schemes are used as known-item searching, where the user knows what to look for and where to look. It is easy to design and easy to use. On the other hand, it is necessary for the user to know the specific name of what they are looking for in these schemes. Within exact organization schemes you find three different approaches:

Alphabetical schemes
The alphabetical organization scheme is the most frequently used. It is used in nonfiction books, phone books, bookstores etc.

Chronological schemes

In order to organize information in a chronological scheme it should have some sort of date, like archives of press releases, history books, television guides etc. The chronological schemes are usually used together with different kinds of filtering options.

Geographical schemes

More and more systems operate with geographical schemes, since location is very important in determining what a user might need to know. With the geographical scheme the user can select the nearest local directory.

While the exact organization schemes are easy, the *Ambiguous Organization Schemes* are more complex, since they are more humanly subjective. They are also important and useful, for systems where the users do not always know what they are looking for. Ambiguous organization schemes group items in an intellectual way, like subjects, which can help the users along their search to find what they are looking for. The ambiguous organization schemes often require more work to design. Some of the most common ambiguous organization schemes are:

Topical organization schemes

The most used, but still challenging approach is topical organization schemes, where the content is organized by topic. It is easy to use for the users, if it is made properly and is customized to the specific system and context.

Task-oriented schemes

The task-oriented schemes organize the content into collections of processes, functions and tasks. It is usually used in apps.

Audience-specific schemes

The audience-specific schemes are being used when it make sense to customize a systems content after audience. It breaks the system into smaller systems, divided by its audience.

Metaphor-driven schemes

A metaphor driven scheme is when information is organized based on a metaphor. A typical example is the use of *desktop*, *folders* and *trashcan* as the main organization of files on a computer. If the metaphor-driven schemes are used a designer must be cautious and be sure the users recognizes the metaphors being used.

Hybrid schemes

When a designer chooses to mix elements from audience-specific, topical, metaphor-based, task-oriented and alphabetical organization schemes, they end up with a hybrid scheme. It should not be used to organize a large amount of content, since the users might be confused by the many ways to consider the information.

Organization structures

Even though we interact with organization structures every day, we rarely think about how we do it. The organization structures define how the users navigate within a system. The structures include *Hierarchy*, the *Database-Oriented Model* and *Hypertext* – sometimes one of them, sometimes two and sometimes all three of them.

Hierarchy

Hierarchies are not only used to organize information in systems. It is also used to organize information everywhere else, e.g. family trees, chapters in books, species etc. This structure is based on dividing information into related subdivisions. A hierarchy gives the users a quick overview of the information and helps them understand where to find the information relevant to them. A top-down hierarchy helps you to identify the content areas, which makes it possible to then organize the content further.

The Database Model

When using a database model, information is organized in records with different fields of further information. Databases are typically organized in tables, where each row represents a record and each column represents a field. A database creates metadata, which is important to an information architect, because it links information architecture and the design of the database. A database can be very complex to create in order to get it right, which is why it is often an information architect who should make the design and a developer executing it.

Hypertext

A hypertext system consists of two components: the items that will be linked and the links between the items. The two components can be connected both hierarchically and nonhierarchically. This kind of structure is based highly on personal associations and is therefore rarely used as a primary organization structure.

Labeling systems

Labeling presents information by labeling the content of the system, in order to make the navigation within the organization user-friendly. Labels make it possible not to overwhelm the users with unnecessary information, by only give them the headline of a category. The users then choose if they want to read more about the specific topic. The purpose of labeling is therefore to make the system easy and manageable to navigate through, without taking up too much space in the system.

Labeling is not something that always gets much attention, which can cause problems. It is very easy to change, even though the designer has to put a lot of thought into what they are changing it to. It is furthermore a clear way to show the users, how the system is organized and how they should navigate through it. The labels should be adapted to the users environment, in order to benefit the users and prevent confusion.

Varieties of Labels

In order to adapt the labels to the user environment there are a variety of different labels to consider. There are two different types of labels: *Textual* and *Iconic* labels. The iconic labels are self-explanatory since they are presented with icons, whereas the textual labels can be divided into four different types of labels:

Contextual links

When labels are used to describe the hypertext links within the system, they need to cover the information about where the link is going. The hypertext links creates the internal navigation in a system and should therefore be precise and simple, in order not to confuse the users.

Headings

When labels are used as headings they establish a hierarchy of the content. It helps the users to navigate through the content and figure out where they are located within the system.

Labels within Navigation Systems

These labels tell the users how to navigate within the system. When not done exact, the labels can make the system unusable to the users. The labels needs to be familiar and commonly used, like *Main Page*, *Search*, *Contact*, *FAQ* etc.

Index terms

The index terms are also known as keywords, tags, descriptive metadata etc. They are used in many different systems, in order to describe the content. The index terms can be visible to the user, or be hidden within the content management systems - only to be used when the user performs a search.

Labeling guidelines

Labeling content is one of the most difficult tasks within the field of information architecture. Because of the different contexts in which the labels are used, they may mean something different to different users. To overcome this problem, the designer can narrow down their labeling scope to a more specific audience. By narrowing it, down it will be easier for the intended user to understand the meaning of a certain label.

It is also important that a labeling system is consistent, because consistency creates a good overview of the system. This makes it simple to learn and use, which is important if the users are first-time users. Consistency does not only benefit first-time users though, it benefits all users in general. In order to get the most consistent labeling system possible, some general guidelines are proposed:

Style – where you consider punctuation and style guides

Presentation – where you consider fonts, sizes and colors

Syntax – where you consider, if your labels should be verb-based, noun-based or question-based

Granularity – where you consider presenting labels equal to their specificity

Comprehensiveness – where you make sure the labels cover every aspect of the content

Audience – where you consider the language of the systems context

Keeping these guidelines in mind will support the process of labeling. Whether it is to make a whole new labeling system or to look at an existing system, it is important to know your system's context, in order to make labels that will help the users and prevent confusion.

Navigation systems

We are confronted with navigation everyday – everywhere. It is used all over to navigate people through their everyday life by maps, street signs, breadcrumbs etc. It is frustrating for users of information systems not to know or understand where they are, which makes navigation systems very useful. It can tell the users exactly where they are, where they were before and where they are going next.

Types of Navigation Systems

A navigation system consists of three basic components: *Global-, Local-* and *Contextual Navigation Systems.* They all have in common, that they provide context and flexibility to the users, helping them to know where they are and where they can go. The three components work together and are presented in layers of information. These layers are illustrated in Figure 15, in which it is also illustrated where they are typically placed in a desktop and mobile application.
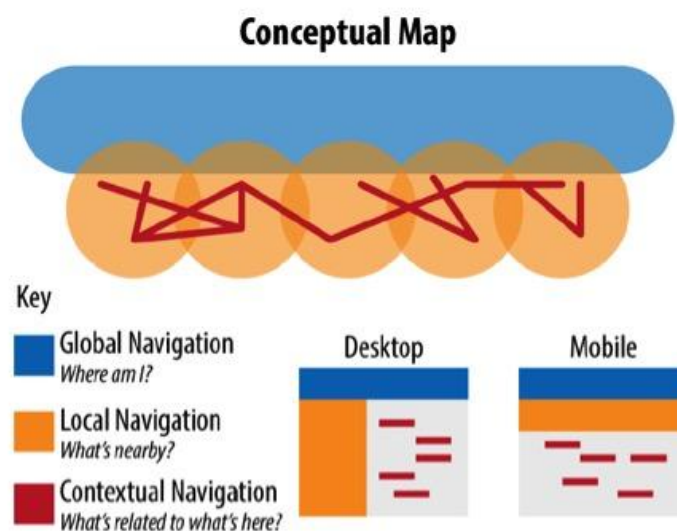

Figure 15 - Conceptual map of navigation (Rosenfeld et al., 2015, p. 177)

Each of the components solves a specific problem and gives specific information to the user.

Global navigation

The global navigation system is presented in every section of a system and is usually presented as a top navigation bar. The top navigation bar will always be accessible - no matter how deep down in the hierarchy the users go. The global navigation system consists of links to the first layer of the systems structure and it informs the user of their current location. The design of the top navigation bar should be based on user needs and the organization structure.

Local navigation

The local navigation systems are also called sub sites, which refer to sites within sites. The content may vary from site to site, so the local navigation system will help the users by informing them about what is nearby.

Contextual navigation

The contextual navigation links are found within the content on a specific site. They refer to other sites related to the content the users are already looking at. Contextual navigation keeps the users in the system until they find what they need by guiding them towards the next step.

The challenge of using Global-, Local and Contextual navigation to design a navigation system is making it easy to use without making it overwhelming. It is therefore necessary to consider how the three systems will work together and not only consider them individually. They can complement each other if used right, but otherwise they may seem confusing to the user.

Supplemental navigation systems can help overcome this challenge. They help ensure usability and findability within large information systems. The users can use sitemaps, indexes and guides to help them find what they are looking for when the structure fails them or they need a quick overview.

Sitemaps

A sitemap shows the system's content structure. It presents the information as it is organized hierarchically in the system, in order to show the user how or where they can find the content they are looking for.

Indexes

An index shows the content of a system by presenting keywords alphabetically – without representing the structure of the system. It only works if the users know what they are looking for, otherwise it can be overwhelming.

Guides

Guides can work in many ways and can be used as guided tours, tutorials etc. Common to them are that they introduce new users to the content within the system.

Search systems

A way for users to find the information they need within a system is by using search systems. Search systems can vary in many ways, but no matter how they are used, they are a challenging

and expansive component. This is also why a designer needs to consider if their system needs search functionality at all.

In order to decide, if an information system needs search systems, the designer needs to, among other things, consider if the system has a big amount of content in the information environment - otherwise the search system will become redundant. A general guideline to follow is, if a system has too much information to browse, a search system will be useful.

Search system anatomy

It is not as easy to make a search system as it might look. On the surface the users only see the search box and the search button, but beneath the surface the search system has a whole anatomy of structures. Search systems rely on many of the components from the Organization systems, Labeling systems and Navigation systems, e.g. Index, which is an important part of the search system. How the Index system is build, is crucial to the results of a search. In order to make a successful search system there are some basic steps a designer needs to follow. These steps are shown in Figure 16 below.
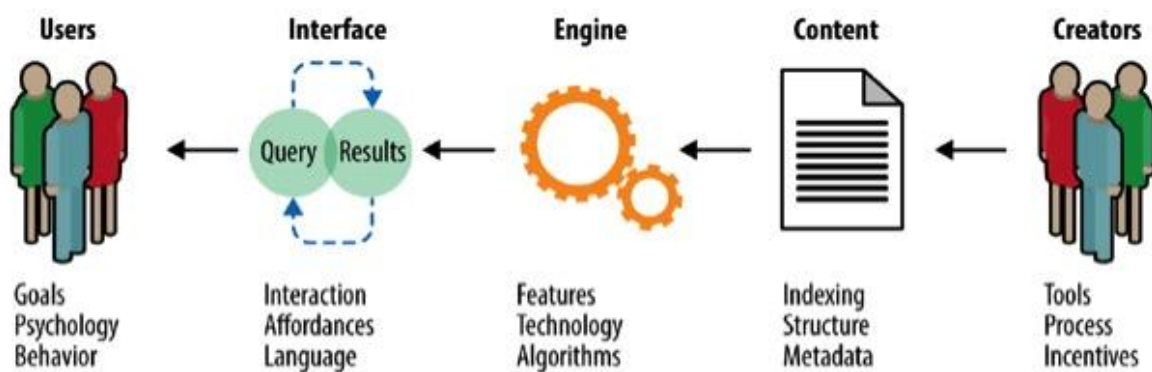
Figure 16 - Search anatomy (Rosenfeld et al., 2015, p. 217)

Creators

The creators are those responsible for designing the search system. They should consider which tools to use and the future process of making the search system.

Content

One of the most important parts in the search system anatomy is the content. The content is the information the users are looking for, which is why it is important to make sure the content is structured and indexed in the most fitting way.

Engine

After having structured and indexed the content, a creator needs to develop the search system. Developing the search system requires a lot from the developers. Making a search system is not easy and creators need to be careful in making it correctly, in order not to lose information along the process.

Interface

When the users search within the search system, they get an amount of results according to their search. The interface of these results can be shown in many different ways, which should be adjusted to the user information environment.

Users

When the search system is done and the users are going to use it, it will give results. These results can be analyzed in order to see what is working well and what can be modified.

These five steps are only related to what should happen during the development of the search system. It is just as important to consider how the search is presented. Rosenfeld, Morville and Arango have put together four important considerations in order to design a search interface that the users will see.

Level of searching expertise and motivation

What motivates the users to use a search system? Looking at the context, a designer needs to know if the users need a high-powered interface or a simpler interface. It will be necessary to examine how much effort the users are willing to apply, in order to get the best result.

Type of information need

The users can have many different information needs, which make it necessary to show a result in many different ways, in order to cover their needs. Looking at the information context helps the designer to get a better understanding of the needs.

Type of information being searched

It is necessary to consider what types of information the users are most likely to be looking for. Are they searching for full text, pages, videos or pictures? It is important to consider, if the content the users are looking for is dynamic, static or maybe visual, to know how to present it.

Amount of information being searched

The users should not be overwhelmed by too many results. On the other hand the results should not be so few, that they do not get the information they are looking for.

IA and rhetoric

As just described, information architecture presents ways to structure information to make it as user-friendly as possible, much like the purpose of the five disciplines of rhetoric is to structure information in an argument. If we compare these disciplines with the components from information architecture, we find similarities, especially for the three disciplines Invention, Arrangement and Styling.

Invention is described as the art of gathering the material needed to perform a speech. But you are not only gathering material before you are writing a speech – you also do it when you are

gathering information content to a system. This is necessary to perform, when creating information architecture. Both are cases where you need to consider what information is relevant to present to the listeners or users. A tool to structure this process is even provided with the description of the information ecology. Where in rhetoric you focus on identifying the central themes necessary for the speech, information architecture focuses on ensuring that the content is also considered with a focus on the users expectations and their context.

When the information is gathered, it needs to be arranged. The arrangement is described as the art of arranging the necessary material the way that utilizes it in the best way possible according to the rhetoric. The information architecture component organization system, gives examples of how to arrange information in the right way, in order to make a system understandable for the users. Both the arrangement and organization systems work towards presenting information in the right way. It therefore makes sense to consider this component, when designing an information system, which needs to communicate something – like persuasion.

Styling is described as the art of expressing the results from the invention and arrangement. Within the field of information architecture, you also consider the styling of the information through labeling systems and navigation systems. Especially labeling, with its six guidelines - style, presentation, syntax, granularity, comprehensiveness and audience - shares similarities with this discipline. Both systems are considered crucial to ensure the quality of the information architecture. These components help the users to find the information they need. We therefore argue, that information architecture presents us with concrete examples of how to perform this discipline with a focus on technology rather than speech.

As the last two disciplines are focused on the physical memorization and delivery of the speech, information architecture does not have a directly linked component that fits them, due to its focus on technology. Instead, it here makes sense to consider database structures for how the information is stored and more detailed graphics and interface designs for the presentation of the information, as a way to translate these disciplines.

These similarities show us that information architecture arguably is a modern response to the five disciplines of rhetoric. As this is also what persuasion is relying on to convey its message, it makes sense to combine the two.

Information architecture guidelines for persuasive technologies

To show how we can incorporate information architecture into a method for persuasive design, we propose four guidelines, which summarize the main points from each of the relevant components in information architecture. These guidelines are based on the presentations of Information Ecology, Organization-, Labeling-, and Navigation systems and their connection to rhetoric. As we could not identify a clear connection between rhetoric and the more technical search component, we have chosen not to include a guideline relating to this. This does not mean that search systems are not an important component of information architecture, but since not all

systems benefit from including a search component, it cannot be considered a general guideline. The guidelines are therefore as following:

- Make sure that all aspects of the user, content and context are considered
- Consider how to organize the information in order to support the user
- Consider the impact of the chosen labeling system
- Ensure that the chosen navigation system supports the styling of the argument through the use of global-, local- and contextual navigation

We find the four guidelines necessary to consider in order to design a system based on information architecture and the disciplines of rhetoric. With these guidelines identified, we can now start to analyze the identified methods based on their relation to persuasion and information architecture.

5 Considering the guidelines
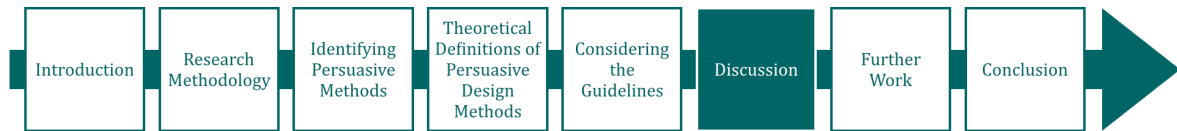
During our literature review, we found the need to dive back into the theoretical framework, to create a framework for how to analyze the identified methods. As this has now been done, we will in this following chapter first consider if the two sets of guidelines can be combined. We examine which methods meet which guidelines, to see what the identified methods focus on. This is done, so that we can use the information to place ourselves in relation to these methods and finally we suggest a method based on the already existing methods, which meets all the guidelines.

5.1 Guidelines to a persuasive model

The guidelines we have identified are based on our understanding of persuasion and the field of information architecture. The arguments for each guideline can be found in chapter 4. The lists are combined into one list of guidelines, which we can go through to assess the methods and what considerations they include. We find it important to combine the different guidelines to ensure that none of them contradict each other.

We base the final analysis on the following final guidelines:

1. Consider all possible outcomes of the use of the technology
2. Define what attitude and/or behavior it aims to change
3. Consider if the subject of the persuasion is willing and how this is ensured
4. Ensure that the persuasion empowers the user
5. Consider when the appropriate moment for the persuasion occurs
6. Make sure that all aspects of the user, content and context is considered
7. Consider how to organize the information in order to support the user
8. Consider the impact of the chosen labeling system
9. Ensure that the chosen navigation system supports the styling of the argument through the use of global-, local- and contextual navigation

As the two types of guidelines were developed independently from each other, a concern can raised be whether some of the guidelines are differently worded duplicates, or maybe even contradictions to each other.

After comparing the different guidelines, we find that none of them contradict each other. This further indicates that the characteristics of the two fields are compatible and can support each other. We did find that some of the guidelines share similarities. Guideline three and five are related to considerations of the user and in what context the persuasion is happening. These are also very closely related to the sixth guideline, which is about considering the information ecology, and therefore also the user and the context.

Despite the similarities we decide that the three guidelines are different enough, so all of them should be included. In order to separate them, we will for the third guideline look specifically into if the user is aware and accepting the persuasion and not general considerations of the user. For the fifth guideline, we will consider if the method includes considerations of not just the context, but also the appropriate time, place and way the persuasion should happen. On the contrary, the sixth guideline is the consideration of not just the user and the context, but also the content. At the same time, it is not just that each area of the ecology should be considered individually, but also if the relationship between all three areas is considered. It therefore makes sense to include all the identified guidelines - despite similarities.

5.2 Analysis - Comparing methods to guidelines

In the following section we describe the results of the analysis of the identified methods. This process is a continuation of the literature review and the SALSA method. This section presents the last A of the SALSA method, in which we make sense of the literature by starting to interpret it and the patterns that were discovered. We do this by comparing our theoretical framework with the identified methods.

When we continue with this analysis, we decide to structure it by dividing the guidelines into tables. In each of these tables we check if the guidelines are included in the different methods - and which ones. We use the tables to visualize our result. For each identified method, we consider if the guideline is fully included, mentioned or not included. We consider a guideline *fully included* in a method, if the method has a focus that are identical to the guideline. We categorize the guideline as *mentioned*, when related perspectives are found in the method, but not in focus. We include this level, as we through our paper found the issue that even though there was a step considering e.g. the intent of persuasion, it did not have sufficient influence on the rest of the design process. We therefore find the distinction between being fully included or just mentioned in a method important. Finally, we have *not included*, which is given to every method that has no consideration of the guideline at all.

5.2.1 Guideline 1 - Consider all possible outcomes of the use of the technology

When we consider if a method includes this guideline, we examine if the method has a section in which it asks the designer to consider how the technology might be used outside of their intention, or in other ways tries to overcome misuse of the technology. The results of this analysis can be seen in Table 6.

Methods	Fully included	Mentioned	Not included
Appeal Belonging Commitment			X
Behaviour Change Wheel		X	
Behavior Grid			X
Behavior Wizard			X
Design With Intent	X		
EDIE	X		
Fogg Behavior Model			X
Fogg's Eight-Step Design Process			X
Functional triad			X
General Persuasion System			X
Influence components model	X		
Inspiration Card Workshop	X		
Persuasive Potential Questionnaire		X	
Persuasive System Design Model		X	

Table 6 - Inclusion of guideline 1

We find that four methods fully include the guideline. We find that the EDIE method, with its evaluation phase in which the designer has to evaluate the learning outcome of the process, fully includes this guideline. The method therefore acknowledges that the design might not do what the designer intends and plans for how to overcome this. The Inspiration Card Workshop is the second method, which we consider to fully include the guideline. The workshop has a focus on including the user in the design process. By offering them a number of cards, which are meant to be combined in as many ways as possible, many scenarios are supposed to be considered. The domain and technology cards should support a discussion of how the technology can be used. The cards used during the Design With Intent method works much like the Inspiration Card Workshop. Here the wording on the cards is meant to provoke reflection on the influence on the design and the guideline is therefore included. Finally, the Influence Component Model has a focus on decoding and encoding the persuasive message. As the method includes these aspects in the model, we believe it is intended to make the designer reflect on how the encoding and decoding happens and especially if the decoding will happen in the way you expect it to, or in another way.

The methods, which we deem to only mention this guideline, are the Persuasive System Design model, the Persuasive Potential Questionnaire and the Behavior Change Wheel. The Persuasive System Design model does mention intention and what will happen with the technology, but does not include considerations of other possible outcomes of the technology. The Persuasive Potential Questionnaire asks if the technology that is evaluated really changes behavior, but does not compare this with whether the behavior that is changed fits the intention. The Behavior Change Wheel mentions reflection as a part of the design process and we can see it is used to ask about consequences. However, it is unclear in the literature, if this is the way the method is intended to be used, or if it is an interpretation of the method. We therefore only include these methods as *mentioned*.

We find that the majority of the methods – seven – do not include any considerations of other outcomes or misuses of the technology they are designing for. Out of the seven methods, three methods - Behavior Grid, Behavior Wizard, Fogg's Eight-Step Design Process - are explicitly including the opposite of the guideline, with a focus on just the one intent the designer has or with a focus on just the technology that works.

5.2.2 Guideline 2 - Define what attitude and/or behavior it aims to change

With this guideline we are considering, if the methods have included a phase in which they explicitly define which attitude or behavior the technology is aiming to change. The results of this analysis can be seen in Table 7.

Methods	Fully included	Mentioned	Not included
Appeal Belonging Commitment			X
Behaviour Change Wheel			X
Behavior Grid	X		
Behavior Wizard	X		
Design With Intent			X
EDIE	X		
Fogg Behavior Model	X		
Fogg's Eight-Step Design Process	X		
Functional triad			x
General Persuasion System	X		
Influence components model			X
Inspiration Card Workshop		X	
Persuasive Potential Questionnaire			X
Persuasive System Design Model	X		

Table 7 - Inclusion of guideline 2

We find that seven of the methods fully include this guideline. The Behavior Grid and the Fogg Behavior Model both stand out to us in relation to this guideline, as the purpose of the methods are primarily to define what type of behavior a designer aims to change and the guideline is therefore fully included. For the Behavior Wizard, the first phase includes defining the behavior the designer wants to change and the guideline is also included here. The first step of Fogg's Eight Step Design model is to choose a simple behavior to target and with this step, the guideline is included. The EDIE method has the phase *explore* in which the current context is ex-

plored, also to identify what needs to change. The General Persuasive System also includes a definition of the change that is expected to happen, with the *goal* part of the method. Finally, for the Persuasive System Design method, one of the first things the designer is asked to define, is the intent of the technology. In other words, the designers should plan what should happen when the technology is implemented. This majority of methods include considerations of what the technology is aiming to do.

We have only placed one method within the mentioned category, namely the Inspiration Card Workshop. We place it here, because even though the goal of this workshop type is to generate ideas for persuasive technologies, the focus is on generating technologies and not on defining what behaviors or attitudes to change. We still consider it mentioned as the interactivity with the users implies discussion of what different changes the technologies can support them with.

However, interestingly enough, we also find that five of the methods do not include this guideline. This comes as a surprise, as we have considered that the definition of what the design should do, would be a big part of a persuasive design method. However, the literature in which these methods are presented, always includes a description of the intention of the design, but as a presentation in the paper's introduction, and not included in the actual method. We find this challenging, because if anyone were to apply these methods without reading the paper to explain how it should be done, they might miss this important step.

5.2.3 Guideline 3 – Consider if the subject of the persuasion is willing and how this is ensured

For this guideline we are looking into, if the methods consider the ethics of trying to persuade a user. For the guideline to be fully included in a method, the method needs to consider if the persuasion happens to a willing subject and have a phase in which it considers how to ensure this. The results of this analysis can be seen in Table 8.

Methods	Fully included	Mentioned	Not included
Appeal Belonging Commitment			X
Behaviour Change Wheel	X		
Behavior Grid			X
Behavior Wizard			X

Design With Intent			X
EDIE		X	
Fogg Behavior Model	X		
Fogg's Eight-Step Design Process		X	
Functional triad			X
General Persuasion System			X
Influence components model			X
Inspiration Card Workshop			X
Persuasive Potential Questionnaire		X	
Persuasive System Design Model		X	

Table 8 - Inclusion of guideline 3

We only identify two methods, which fully include this guideline. The Behavior Change Wheel has a focus on the user's psychological capability. In this method the designer needs to consider if the user is capable of the intended persuasion, not just physically, but also mentally. If not, then the behavior change cannot happen. Fogg Behavior Model also has a focus on whether or not persuasion can actually happen, by identifying the user's state of mind. We therefore conclude that both of these methods fully include this guideline.

We do find that four methods mention the guideline. The EDIE method mentions that users will not change if they do not want to. However, this does not stop the design process, but rather encourages the designer to move onto other subjects who might be willing. Fogg's Eight Step model has the same issue, as its step 2 is about choosing a receptive audience. While both acknowledges that forcing persuasion on a non-receptive audience is not working, they do not consider whether it might be the persuasion that is unethical and should not be performed. The Persuasive Potential Questionnaire also asks users to rate if the statement "*I do not want to be influenced by others*" (Alexander Meschtscherjakov et al., 2016, p. 169) relates to them, although this does not automatically deem the persuasion unethical. The Persuasive System Design model has the phase Event in which the designer includes consideration of the user as well as con-

siderations of the intention, but the method does not give indication of stopping the design process if the two are not compatible.

We find that the majority of methods, with a total of eight, do not include or mention something related to this guideline. Some of the methods instead focus on their goal, like the Influence Components Model which describes *targeting people* to persuade users, proving the opposite of this guideline. That so many methods do not show consideration for the ethics of persuasion, seems much in line with the criticism already presented by Atkinson in 2006 – unfortunately the field seems have moved little in this regard

5.2.4 Guideline 4 - Ensure that the persuasion empowers the user

For a method to fully include this guideline, it needs to show steps towards empowering the user by making them independent from the persuasive technology, while the changed attitude or behavior remains. The results of this analysis can be seen in Table 9.

Methods	Fully included	Mentioned	Not included
Appeal Belonging Commitment			X
Behaviour Change Wheel			X
Behavior Grid			X
Behavior Wizard			X
Design With Intent			X
EDIE	X		
Fogg Behavior Model		X	
Fogg's Eight-Step Design Process			X
Functional triad			X
General Persuasion System		X	

Influence components model			X
Inspiration Card Workshop			X
Persuasive Potential Questionnaire			X
Persuasive System Design Model			X

Table 9 - Inclusion of guideline 4

The EDIE method is the only method we find which fully includes the guideline. The guideline is included because of the method's focus on learning and reflection. Technologies are designed to bring reflections to the user.

The Fogg Behavior Model might support the guideline, depending on how it is used. The model does not give many details about the design process. If the method is understood so that a technology should help change the attitude of a user to a certain point, in which they will have both the motivation and ability to perform the intended behavior regardless of the technology, then it would be fully included. However, if the model is understood in the way that the change only remains as the technology is present - then it is not. We therefore only include it as mentioned. For the method General Persuasive Systems, we find the same issue, as it does not have a lot of detailed descriptions of the phases. The model seems to have a waterfall approach, showing that the persuadee gets the persuasive message through the channel and then moves onto the behavior change. It does *not* show that the persuadee repeatedly needs to return to the channel. However, it is not obvious if this is how the method should be understood. It is therefore placed in the mentioned category.

The remaining 11 methods do not include any consideration of how the user should be independent of the technology. Some of the methods, like the Persuasive Potential Questionnaire and Appeal Belonging Commitment methods, actually seem to emphasize the opposite of the guideline. They find commitment to the use of the technology as a positive consequence.

5.2.5 Guideline 5 - Consider when the appropriate moment for the persuasion occurs

When examining if the methods are considering when the appropriate moment for the persuasion occurs, we are looking for, if the information is given to the users at the right time, at the right place and in the right way. The results of this analysis can be seen in Table 10.

Methods	Fully included	Mentioned	Not included
Appeal Belonging Commitment			X
Behaviour Change Wheel		X	
Behavior Grid			X
Behavior Wizard	X		
Design With Intent			X
EDIE	X		
Fogg Behavior Model			X
Fogg's Eight-Step Design Process		X	
Functional triad			X
General Persuasion System			X
Influence components model	X		
Inspiration Card Workshop			X
Persuasive Potential Questionnaire			X
Persuasive System Design Model		X	

Table 10 - Inclusion of guideline 5

The guideline has three methods that fully include it. One of these methods is the EDIE method, which consists of four processes, whereas one of them is Explore. As the method emphasizes ethnography in this phase, as a way to include consideration of Kairos, we find it easy to conclude the method fully includes the guideline. The Influence Components Model do also fully include the guideline since it considers time and space within the encoding of the message, in order to translate its message to the audience. It therefore both considers time, place (channel in which to interact) and way (the encoding) that the message should be sent. This is why we

categorize it as fully included. The last method that fully includes the guideline is the Behavior Wizard method. The Behavior Wizard do among other things, consists of triggers. These triggers are connected to the right situation to give the information in the right way, which are related to the guideline.

The three methods that only mention the guideline all have in common that they are missing an aspect of Kairos. Fogg's Eight-Step Design Process is missing the right place, the Behaviour Change Wheel is missing the right time and Persuasive System Design model has consideration of the context, but no consideration of how it influences the opportune moment. It is noteworthy, that it differs which aspect the methods are missing.

5.2.6 Guideline 6 - Make sure that all aspects of the user, content and context is considered

When considering if the information ecology has been used in the methods, we examine if the methods are considering the users of the system, the context they are in and the content they are looking for. The results of this analysis can be seen in Table 11.

Methods	Fully included	Mentioned	Not included
Appeal Belonging Commitment			X
Behaviour Change Wheel	X		
Behavior Grid			X
Behavior Wizard			X
Design With Intent			X
EDIE	X		
Fogg Behavior Model			X
Fogg's Eight-Step Design Process		X	
Functional triad			X

General Persuasion System			X
Influence components model	X		
Inspiration Card Workshop	X		
Persuasive Potential Questionnaire			X
Persuasive System Design Model		X	

Table 11 - Inclusion of guideline 6

The results of this guideline show us that it is varied whether the methods take this guideline into account. Our results show that four methods fully include the guideline. The Behavior Change Wheel is an example of a method that is considering the user, content and context. When considering the capability and the motivation, it has the users in mind. It also considers the users' context by looking at the physical and social aspects and finally it considers the content, by looking at the intervention functions. Another method that considers all three elements by using other words is the Influence Components Model, where the message covers the content, the audience covers the user and the users context is an overall consideration. EDIE and Inspiration Card Workshop, both have a phase in which the users are included to consider the context they find themselves in and what content they might like. With their focus on including the users in the process, much like information architecture's own user-centered approach, we find they fully include the guideline in the processes.

Two of the methods only mentions this guideline. One of them is Fogg's Eight-Step Design Process, where the user and context are considered, but not the content. For the Persuasive System Design model, we find that it does include consideration of the context and the user. But this phase is separated from the process in which the content is considered. The model therefore does not include a sufficient combination of how all the areas influence each other, which is why we do not consider it fully included.

For the eight methods that do not include the guideline, we find it necessary to categorize them as not included for a number of reasons. Some methods do not consider any of the three aspects from the ecology, where others only consider one. One of these is the Persuasive Potential Questionnaire, which considers the user, but not the remaining two areas.

As the Information Ecology is a framework from information architecture, which has not been introduced to the field of persuasion before, it makes sense that it is not included in every method. However, with just under half of the methods including related considerations, it is an area, which is worth exploring and making explicit in a model.

5.2.7 Guideline 7 - Consider how to organize the information in order to support the user

While looking for this guideline in the different methods, we are considering how and if it is considered in the method, how to organize the information in order to support the user. The results of this analysis can be seen in Table 12.

Methods	Fully included	Mentioned	Not included
Appeal Belonging Commitment			X
Behaviour Change Wheel			X
Behavior Grid			X
Behavior Wizard			X
Design With Intent			x
EDIE			X
Fogg Behavior Model			X
Fogg's Eight-Step Design Process			X
Functional triad	X		
General Persuasion System			X
Influence components model			X
Inspiration Card Workshop			X
Persuasive Potential Questionnaire			X
Persuasive System Design Model	X		

Table 12 - Inclusion of guideline 7

This guideline is the first guideline directly related to the information architecture components. By looking at these results, we can see how the persuasive field has not had information architecture and its components in mind when the methods were created, with only two methods fully including it.

The Persuasive System Design model is one of the methods that fully include the guideline. The model includes a number of principles for the technology design and some of these principles consider how information should be organized in order to support the user. One of these is the principle *Personalization,* which considers how the information should be organized and presented, in order to make sure that the system offers the content the user need. Furthermore the principle *Tunneling* is a way to organize how the user gets information. Another method which fully includes the guideline about organization is the Functional Triad. This makes sense, since the Persuasive System Design model is based on the Functional Triad and we just established that the Persuasive System Design model do fully include the guideline. Even though the Functional Triad does not mention Personalization, it does mention *Tailoring*.

5.2.8 Guideline 8 - Consider the impact of the chosen labeling system

When looking through the methods in order to consider this guideline, we are looking for phases in which the method considers what labeling to use and the results thereof. The results of this analysis can be seen in Table 13.

Methods	Fully included	Mentioned	Not included
Appeal Belonging Commitment			X
Behaviour Change Wheel			X
Behavior Grid			X
Behavior Wizard			X
Design With Intent			X
EDIE			X
Fogg Behavior Model			X

Fogg's Eight-Step Design Process			X
Functional triad	X		
General Persuasion System			X
Influence components model	X		
Inspiration Card Workshop			X
Persuasive Potential Questionnaire			X
Persuasive System Design Model	X		

Table 13 - Inclusion of guideline 8

The results show that there is a majority of methods, which do not include considerations of the labeling system. Only three methods fully include this guideline. One of the methods that fully include this guideline is the Persuasive System Design model - the same as the results of the previous guideline. Like we found previously, the many principles within the model, is what makes it fully include the guideline. A principle that considers labeling is the *Similarity* principle, which refers to the fact that people are more readily persuaded through systems that remind them of themselves, and the designer should therefore consider their wording. Furthermore the method Functional Triad, also fully includes the guideline regarding labeling. This shows again the close relationship between the Persuasive System Design model and the Functional Triad, as they fulfill the guideline through the same principles. The Functional Triad, among other things, focuses on influencing the users through language and therefore also which labels to use in a system. The Influence Components Model fully includes the guideline in the message component and the encoding and decoding of it. The designer therefore needs to consider how the message best can be presented so the audience can understand it.

5.2.9 Guideline 9 - Ensure that the chosen navigation system supports the styling of the argument through the use of global-, local- and contextual navigation

When we consider if the methods support this guideline, we examine if they give any support to designers about considering or choosing a navigations system which fits their needs. The results of this analysis can be seen in Table 14.

Methods	Fully included	Mentioned	Not included
Appeal Belonging Commitment			X
Behaviour Change Wheel			X
Behavior Grid			X
Behavior Wizard			X
Design With Intent			X
EDIE			X
Fogg Behavior Model			X
Fogg's Eight-Step Design Process			X
Functional triad			X
General Persuasion System			X
Influence components model			X
Inspiration Card Workshop			X
Persuasive Potential Questionnaire			X
Persuasive System Design Model			X

Table 14 - Inclusion of guideline 9

The last guideline shows that none of the 14 methods ensures that the chosen navigation system supports the styling of the argument. When this guideline is not being considered in any of the methods, it shows that a Global-, Local- and Contextual navigation system were not considered when creating the methods.

The only methods which arguably slightly mention the guideline is the Persuasive System Design Model and the Functional Triad, which among others consist of the principle Tunneling. Tunneling is guiding the users through a process or experience and is meant to provide oppor-

tunities for persuasion along the way, which is connected to how the users should navigate the system. However, since only one out of 28 principles is about one type of navigation, we have made the conclusion, that even though the Persuasive System Design model and the Functional Triad has mentioned a navigation system, it does not include consideration of navigation in general.

5.3 The results

After having placed our 14 methods in tables with our nine guidelines, we place our results in tables that are divided into the four quadrants of Sanders Research Design Landscape. We do this, in order to examine if there is any connection between the results and the methods' placement on the landscape.

5.3.1 Expertly Design-led

Method/Guideline	1	2	3	4	5	6	7	8	9
Appeal Belonging Commitment									
Fogg's Eight-Step Design Process		X							

Table 15 - Expertly Design-led guidelines result

With only two methods placed within the field of expertly design-led, we assume in advance that the results will reflect this with a low number of guidelines considered. Our assumption is right and only one guideline is met in one of the methods, which can be seen in Table 15. The Appeal Belonging Commitment method does not take any of the guidelines into consideration. This is one out of only two methods, which are not considering any of the guidelines at all.

5.3.2 Participatory Design-led

Method/Guideline	1	2	3	4	5	6	7	8	9
Design With Intent	X								
EDIE	X	X		X	X	X			

Inspiration Card Workshop	X					X			

Table 16 - Participatory Design-led guidelines result

The results from the participatory design-led quadrant are more surprising, which can be seen in Table 16. Even though there are only three methods in this quadrant, they meet a relatively high number of guidelines. Especially the EDIE method stands out with five guidelines considered. The Inspiration Card method only takes two of the nine guidelines into consideration. The Design With Intent method only considers the first guideline about consideration of all possible outcomes. Interestingly for this area of the landscape, the methods consider much of the same guidelines, with EDIE just fully including more than the Inspiration Card Workshop and Design With Intent method.

5.3.3 Expertly Research-led

Method/Guideline	1	2	3	4	5	6	7	8	9
Behaviour Change Wheel			X			X			
Behavior Grid		X							
Behavior Wizard		X			X				
Fogg Behavior Model		X	X						
Functional triad							X	X	
General Persuasion System		X							
Influence components model	X				X	X		X	
Persuasive System Design Model		X					X	X	

Table 17 - Expertly Research-led guidelines result

The Expertly Research-led quadrant is the most popular quadrant among the methods. The results show a variety of guidelines that are taken into consideration, which can be seen in Table 17. The methods consider all from one to four guidelines, but which guidelines that are taken into consideration differs vastly from method to method. The methods that only consider one

guideline are the Behavior Grid and the General Persuasion System. The method that considers the most guidelines is the Influence Components Model. When looking at the guidelines, we can see that guideline four about empowering the user and guideline nine about considering navigation are not considered at all in this quadrant. Guideline one about all possible outcomes is only considered by one method.

5.3.4 Participatory Research-led

Method/Guideline	1	2	3	4	5	6	7	8	9
Persuasive Potential Questionnaire									

Table 18 - Participatory Research-led guidelines result

There is only one method placed in the Participatory Research-led quadrant, which can be seen in Table 18. The method is the Persuasive Potential Questionnaire and is the second method in this analysis that does not take any of the guidelines into consideration.

5.4 What can we learn from the results?

We use the results we get from this analysis to examine what works well for the methods and what does not. We do this, in order to get an understanding for what a new possible method can consist of.

As the methods are placed unevenly on the landscape, this influences our results. The most guidelines are fully included within the quadrant of Expertly Research-led, due to the larger number of methods present. Interestingly enough, the Participatory Design-led also includes a large number of guidelines, but with only three methods placed here, there is less variety in which guidelines they include. We choose to take inspiration from the characteristics of the two quadrants, to propose a new method, as they include considerations of the two guidelines.

When looking at all the methods in the two quadrants, we find that the EDIE method is the method that has considered the most guidelines. We decide to base most of our new method on this existing method. In order to do so, we focus on the guidelines the EDIE method meets, which is guideline one – about considering possible outcomes, two – about defining the change, four – about empowering the user, five – about the appropriate moment and six – about the information ecology. We want our new method to consider all the guidelines, so we are still missing inclusion of guideline three – about willingness of the user, seven – about organization of information, eight – about labeling of information and nine – about navigating through information. There are two methods, which considered both guidelines seven and eight: the Func-

tional Triad and the Persuasive System Design model. With three guidelines fully included, the Persuasive System Design Model meets the most guidelines of the two methods and we therefore decide to base guideline seven and eight on this method. There are two methods that fully include guideline three: Fogg Behavior Model and Behavior Change Wheel. Since the two methods take the same amount of guidelines into consideration, it is not possible for us to exclude any of them and we therefore base consideration of guideline three on both of them. Since none of the methods are including guideline nine, we cannot base the last guideline on any method. We will still include the guideline, since we define it just as important as the rest of the guidelines in section 5.1.

After having decided, based on the results, that we will base our new method on these four methods, we want to place our own method within the landscape. We do this in order to understand what characteristics our method should meet. The EDIE method stands out by being the only one placed in the middle of the landscape, which makes it the only method that takes both of the approaches and both mindsets into consideration. Despite this, we describe the method as if it belongs in in the participatory design-led field, because of the way the method involves the user and their participation in the literature.

The rest of the methods are placed in the Expertly Research-led quadrant. As most of the methods for persuasion are placed within this quadrant, a concern can be if the designers of persuasive technologies will not adopt any method that is placed in an opposite mindset. We therefore consider that our method should not only need to be designed in a way that all guidelines can be met, but also so the method will be taken into use. As our guidelines have a focus on understanding the user, placing the method close to the expert mindset can be misleading. However, if someone wants to apply it within this mindset, the method should be adaptable to it. Like the EDIE method, we therefore place our method close to the middle of the landscape, with the aim of making it easier to adopt into the field of persuasion. Our placement is illustrated in Figure 17.
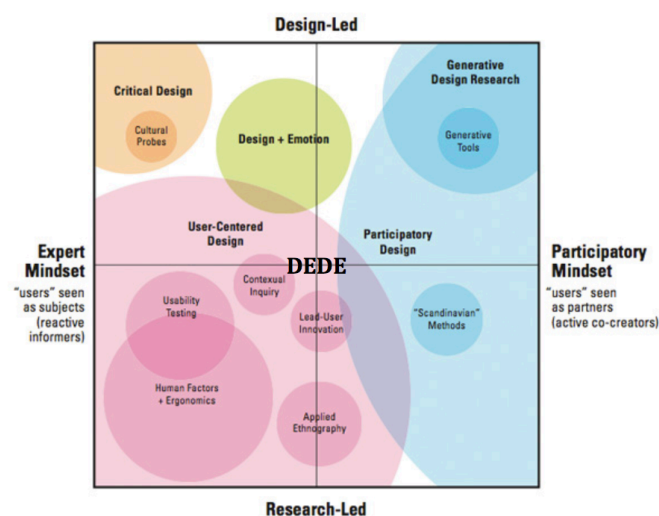

Figure 17 - Our placement on Sanders Research Design Landscape

With these general considerations of how to propose a method, which fully includes all nine guidelines, we find it necessary to explain exactly what aspects of each method we will be including. This elaboration presents detailed reasons for exactly what these methods add to a new method.

From the EDIE method, we get aspects that cover guideline one, two, four, five and six. EDIE's Evaluation phase, in which the designer focuses on how the final technology can be used, is something we want to bring into our method, to cover the first guideline. It is important that the process includes critical consideration of all the ways the technology can be used, before it is considered ready to be given to the users. We also include EDIE's Explore phase in our method, to guide how the second, fifth and sixth guideline can be supported. In this phase the aim is to understand the current situation of the users, within their context and what they might need. When performing this phase the designer is therefore able identify what needs to change. They also have the opportunity to consider when the appropriate moment for the change can be, as well as the relationship that is found between the user, context and content. To support the fourth guideline, we also include EDIE's focus on learning and reflection into the method, in order to remind designers that the users should not become dependent on the technology - but rather be empowered by the technology. To support the third guideline, we choose to include the Behavior Change Wheel's focus on the psychological capability of the intended user and Fogg Behavior Model's focus on the users' state of mind. This means, aiming to consider if it is even applicable to try to persuade the users towards the change.

For the remaining guideline seven and eight, which are related to the components of information architecture, we use the persuasive principles as presented in the Persuasive System Design model. However, these need some adaptation to include all the aspects of each component. For the ninth guideline, we found no methods we can be inspired by, but as this is considering an information architecture component like the previous two guidelines, we choose to be inspired by the format of the Persuasive System Design model for this guideline as well.

With these components presented for a method, which includes all guidelines, we can therefore present a proposal for a new method, which includes all of our presented guidelines.

5.5 The DEDE method

Based on the previously described components, we propose the DEDE method. The method consists of four phases: *Define*, *Explore*, *Design* and *Evaluate*. Each phase influences the following phase, which makes the order of the design process important. A visualization of the method can be seen on Figure 18.
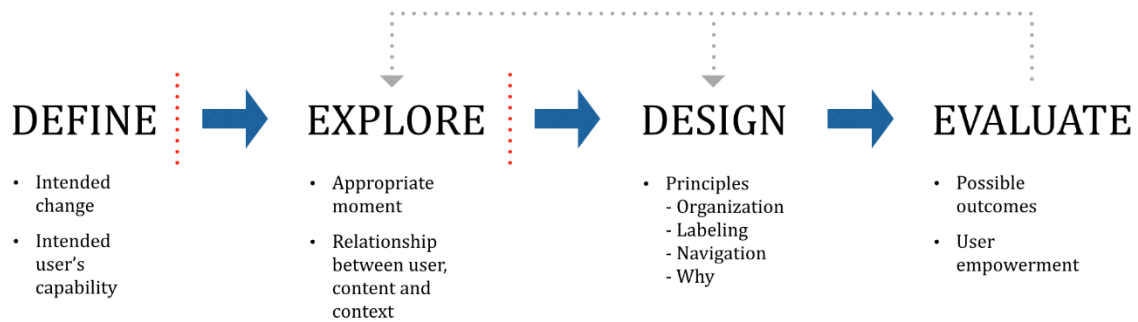
Figure 18 - The DEDE method

In the phase Define, we intend to focus on guideline two and three - defining what is intended to change as well as considering if the person is willing to change. The very first thing that is necessary to do before starting a design process, is to be clear about the intended change, as well as consider if this is an ethical change to make for the intended users. In order to do so, ethnographic tools can be taken into use – e.g. observation and inclusion of the users. To consider the willingness of the intended users, we find that there needs to be a focus on understanding the psychological capabilities, and if they are able to agree to the persuasion.

The outcome of this definition phase is therefore an understanding of how and if the technology, that the designers want to design, is even ethically possible. At the end of this phase, an important aspect of the method is that if the two definitions are not connected, then the designer does not continue to the following phases. This means, that with this method, not every design project will go further than the first phase, to ensure that the designers do not move from persuasion to manipulation or peithenanke, just to reach the intended behavior or attitude change.

The next phase is the Exploration phase. Here the designers need to have the definition of the users and the behavior change in mind, as they explore the context in which the technology is meant to be used. During this phase, we find it necessary to include the user. To remain within the placement towards the middle of the Sanders Research Design Landscape, this phase can be done both in a more participatory or expert-led way, as the designers see fit. However, during our analysis of the existing methods compared to the different guidelines, we considered it necessary to include the users in some form. This is done, to be able to fully include considerations of both the appropriate moment, as well as how to compare the definition of user created in the first phase, with what content to display and in which contexts. All of this should be explored within the scope of the previously defined intended change.

With this extended understanding of the context and its relationship with the user, another possible stop appears in the process. If it is not possible to identify a context or moment in which it will be appropriate to intervene, there is no reason to continue with the following phase.

When it has been defined that persuasion can be applied, the designers can start the Design phase. Here we believe it is possible to use the same principles as the Persuasive System Design

model uses, as seen in appendix 4. However, to ensure that these principles are applied, not just with consideration for information architecture, but also for the results of the two previous phases, we believe that for each principle the designers adds to a design, they need to consider:

- Where in the organization is it applied?
- Is the labeling consistent with the user and their context?
- How is the user going to navigate to or from the principle?
- Why is this principle included in the design?

When designing the technology based on these principles, our intention is to have the designers actively reflecting on why they are applying principles. We want them to argue for how they are organizing the principles and describing them, so the persuasion can become available in the best possible way to the user. By explicitly implementing this reflection, we want to avoid designers just applying any number of principles and considering this sufficient to be persuasive, without comparing their design with the results found within the two previous phases. For this method to work, we find it important that this phase is heavily based on the results of the previous phases.

The final phase is the Evaluation phase. It is important that this phase is performed before the system is introduced in the context. The purpose of this phase is to ensure that all the considerations of the phases are taken into account in the final design. It needs to be considered in relation to the identified context, considering possible outcomes of introducing the technology, with a focus on identifying possible negative outcomes as well. The design will then be adapted to limit any identified issues. At the same time, this will be the phase, in which the use of the technology is considered over a longer period of time. We argued, that over time a persuasive technology should not make the user dependent on it, but rather empower the user into a change. This phase is therefore also where the designers need to specifically plan in which timeline they believe a behavior or attitude change will happen independently from the technology. They can in this phase adapt the technology to support this timeline, by applying more learning perspectives and causing more reflections within the users.

With these four phases, based on the already existing methods within persuasive design as well as the guidelines from persuasion and information architecture, we believe it is possible to design persuasive technologies with sufficient ethical considerations. The main difference with this method is the fact that we include the belief that persuasion not always can be applied to any design which aims to change behaviors or attitudes. The first step is therefore always to identify if persuasion can be applied. This means that with this method the process might be forced to stop, if persuasion is not deemed possible. Another difference is how method includes reflections of the information architecture. The designers cannot implement persuasive principles, without considering the organization, labeling and navigation systems and how they empower the users.

6 Discussion
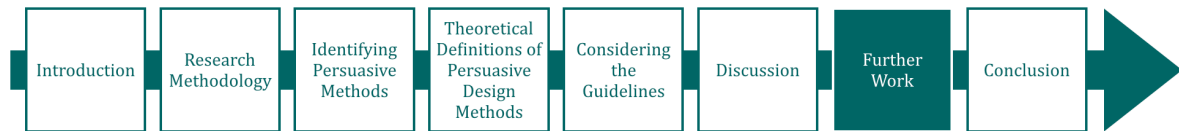
In this chapter, we reflect upon the results of our analysis. First, we discuss the challenges of creating a method that will be taken into use. Secondly, we reflect on the influences of the choices made during the literature review and finally we discuss whether the difference between methods for design and evaluation has influenced our results.

6.1 The 1-use curse

When creating a new method, a concern will always be if the method not only works, but also if it will be taken into use. This concern is fairly relevant to consider for the DEDE method, as our literature review shows that the majority of the general methods for persuasive design are only used once. That single use is often the paper in which the method is presented. With this in mind, an obvious question can be if this will be any different for the DEDE method?

We can argue that by using Sanders Research Design Landscape to identify the main approach and mindset that is found within the field, we have gained a deeper understanding of how the field considers persuasive design. By knowing this and placing ourselves on the map in a way that influence how the method can used, we limit the concern that the method will be too different from the already existing methods, to be taken into use.

However, our analysis also shows that having the same mindset and approach will not be enough to avoid what we have chosen to call the *1-use curse*. Most of the methods are found within the same quadrant of the landscape and these are just as likely to only be used once, as the methods found in the different quadrants. So while the fact that we take the most used approach and mindset into consideration while developing the method can play to our benefit, it is not a guarantee that the method will be accepted either.

What further enhances the DEDE method's chance of acceptance is the way it is created. By focusing on the already existing methods and the components of these that work, the different parts of the method are not just invented for our project, but rather is something that has already been used within the field. This adds both familiarity to the method, but also ensures that the components have been tried and tested at least to some degree previously.

The literature review shows that the most popular method used within the field is the Persuasive System Design model. Despite it mostly being used at one specific university, its popularity is still not surprising, when considering the results of our analysis. Even though it only fully in-

cludes considerations of three of the guidelines, the method has at least mentioned all other guidelines except for guideline nine, which no other method considers either. This shows us that while this method has some challenges with combining and using everything it mentions, it is a method that covers a lot of the different aspects of persuasive design and information architecture. As our method aims to do the same, by not just mentioning but fully including the different guidelines, this can only benefit our method. If the reason the Persuasive System Design model is accepted is due to its wide scope, then it can also be the case for the DEDE method.

The one main reason for a method being accepted is if it actually *works* and the designers are able to create persuasive designs by using the method. It will not be taken into use, if it is hard to understand or use. It has been previously stated that the field of persuasion has a lack of empirically tested methods and this might be why they are not used more (Torning & Oinas-Kukkonen, 2009). As we have not introduced the method to any designers or tested if they are able to create persuasive designs with it, we cannot be entirely sure that the method works or can be understood. However, as we use a literature review to guide the proposal of this method and based it on other already established methods, it is based on the research already performed within the field.

While we cannot guarantee anything without testing it and evaluating how it will be used, we have taken a number of precautions. This is done by developing the method on the basis of an extensive literature review, taking into account the patterns for already existing methods within the field and the mindset of persuasive designers. While the DEDE method is new to the field, the components it is created with are not, which is why we believe that it has the potential to overcome the 1-use curse.

6.2 The structure of the literature review

As this thesis is based mostly on the literature review, some might raise questions to the structure and results of the analysis. Maybe some will believe that a certain method is missing from the list, that a method is used more often than we found, or that some of the identified methods should not be on the list.

The way we structure the literature review is based on our research question, as well as the scope of the thesis. This means that during the first steps of the appraisal, in which we are to consider if the paper is focused on methods, we primarily decide based on the abstract of each paper. This has the consequence that unless a method or design process is mentioned in the abstract, it will already be excluded even if the content of the paper actually contain the use or presentation of a method, which falls within the scope of this thesis. However, we still believe that the approach is appropriate for this research. Due to the large number of identified papers, as well as the timeline for the project, reading the abstract is the most efficient way to get an understanding of the content of the paper. The purpose of the abstract is to summarize, not just the content of a paper, but also the process and the results. It should therefore be sufficient to

read the abstract to get an understanding of the paper and this is the reason we believe this sorting process to be structured enough for the purpose of this thesis. If any methods are missed, due to us focusing on the abstract, then it might be questioned if the abstract is sufficiently detailed.

The second appraisal phase is the phase in which we choose to only identify the methods which can be used for general design or evaluation and not just the case specific methods. This is a choice we have to make, based on our research question. Methods which only consider very specific cases, or giving guidelines for very specific types of designs, cannot be used elsewhere, and can be hard to translate into a method any designer can use. This is why we decided these are outside the scope of our thesis. It is possible that some of these methods might contain aspects, which can be interesting and possibly support the method that we end up proposing. However, it would require a different form of research than what we performed.

While it might be true that some papers that contain methods that are relevant for our research have been overlooked, this would be caused by the structure of the literature review. We believe that the way the review is structured, is the most efficient and correct way for it to be conducted for this thesis. We believe we identified all the necessary literature, as defined by the scope of the project.

6.3 The difference between design and evaluation

Another choice we made during the review is to include both methods for design and methods for evaluations. The decision means, that even though the methods have different purposes they are analyzed based on the same criteria, which might have an influence on the results. Three of the methods are purely used for designing systems while three are used for evaluating and eight methods are used for both, as seen in Table 19.

Method	Design	Evaluation	Overlap	Total	Amount of fully included guidelines
Appeal Belonging Commitment			1	1	0
Behaviour Change Wheel		1		1	2
Design With Intent	1			1	1

EDIE			1	1	5
Fogg Behavior Model	1	3	1	5	2
Fogg's Eight-Step Design Process	2			2	1
Persuasive Potential Questionnaire		1		1	0
Persuasive System Design Model	6	12	3	21	3
Inspiration Card Workshop		1		1	2
Influence components model			1	1	4
General Persuasion System			1	1	1
Functional Triad		2	1	3	2
Behavior Wizard	1			1	2
Behavior Grid	2	2		4	1

Table 19 - Overview of methods used for design or evaluation

The concern of the difference in methods influencing the results can be raised if you consider the results of e.g. the Persuasive Potential Questionnaire. The method is only for evaluating persuasive systems and is also one of the methods, which do not include or mention any of the guidelines for a persuasive method, while the other evaluation methods include two guidelines. It might imply that the guidelines set criteria that were unfitting for the evaluation methods and that they cannot be considered in the same way as the methods meant for design. This would mean, that we during our literature review only should have focused on the design methods.

However, if we consider the difference between the purpose of a design method and evaluation method, we will argue that while they might be applied in two vastly different cases, before or

after a design is finished, that they are just two sides of the same process. For persuasive design methods, the aim is to ensure that the technology is designed to be persuasive while the evaluation methods aim towards seeing whether the technology is actually persuasive. While overall the purpose is different, because one method is meant for designing a technology and one is meant for evaluating it, the general purpose is actually for both cases to identify how persuasion is implemented in technologies. At the same time, the methods which were meant for design or both purposes, do not achieve much better results during the analysis, with their number of fully included guidelines being between zero and five, with most only including two guidelines as well. We therefore argue that as the guidelines are supposed to support how persuasion is implemented, it makes sense to include both types of methods in the analysis as well as using the same framework to analyze them.

This also means, that the results of the analysis is still applicable, despite the different main purposes of the methods. The understanding of the connection between design and evaluation also means that the proposed method that the results lead towards, are not necessarily only for designing persuasive technologies. It can also be a framework for what a designer should consider, when evaluating whether any technology is persuasive. The four steps will therefore be about evaluating, if it is clearly defined what behavior the technology is aiming to change and who it is changing for, as well as exploring what contexts and at what moment the technology is used. The two stop blocks in the method, will also minimize the risk that an evaluation will just be related to how many persuasive principles are implemented. The two stop blocks in the method remain an important aspect, for both evaluation and design.

7 Further work
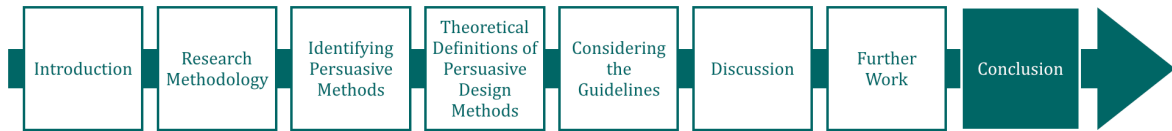
Based on the results of our extensive literature review, we have identified a number of ways, in which the research started in this thesis, can be continued. In the following section we propose three types of research that could be conducted, following our work. First, we propose different ways to empirically test the DEDE method. Secondly, we describe an extended literature review of the methods we identified, to get further knowledge of their characteristics. Finally, we propose looking more into the characteristics of the case specific methods.

7.1 Evaluation of the DEDE method

We use the results from the analysis to propose the DEDE method based on our literature review and the nine guidelines we defined in the analysis. However, we are aware that we did not test the method, so we cannot prove that it will work.

When creating a new method, it is important to see if it works as planned. By testing it you get the chance to correct and adapt all possible errors, in order for it to be as useful as possible for the designers. As previously mentioned, the lack of empirically tested method within persuasion is an issue and this method should not become another untested design approach (Torning & Oinas-Kukkonen, 2009). Before it is taken into use, it is necessary to evaluate the method. However, performing the evaluation is outside the scope of this thesis.

We therefore propose that in further work, the DEDE method should be empirically tested. A test of the method will not only be able to show if the method works as intended – it will also be able to tell, if the guidelines are valid to build our method on. We choose to combine guidelines from persuasion and information architecture - something that our literature review shows has not been done within the field of persuasion before. Getting a further understanding on how the two fields are working together, can help to get a better understanding of the methods within the field and are therefore another way in which further research might be needed.

If someone is to test the new method, we propose several ways of doing so. The participants for the test can be handpicked designers working in different fields, in order to get feedback and different perspectives and not just from one field. This will test if the method is understandable

by someone who is not used to working with persuasive technologies and information architecture. The test itself can be arranged in different ways.

One way can be dividing the participants into two groups, both working towards the same goal, but where one group will be using the DEDE method and other group will be using a different method e.g. the most used method within the field, the Persuasive System Design model. The test will involve consideration of if the designers arrive at different types of designs, or if there are any distinct differences in the way they are working, depending on what method they apply. This can also be done in the same way, but where the methods are used to evaluate an already existing technology. It could be interesting to see if the results of applying the two methods, reaches the same conclusions in relation to the level of persuasion.

A different test can focus only on the DEDE method, gaining more specific information on how people understand the terminology and how to use it. This testing can be done with both experienced designers, as well as less experienced designers, to see if a certain level of experience is necessary to use the DEDE method.

In further research it would be reasonable to look deeper into the different ways of testing a method, before choosing one. The different ways to test the method will most likely give different results, depending on which test there has been used. Common to these different ways of testing the method is to find out if the designers in every situation find the method useful and helpful in order to complete their persuasive design. They should be able to use it as a step-by-step guide during the design process, in order to make sure that the system is persuasive and has all the guidelines incorporated.

7.2 Persuasive methods beyond the conferences

In our analysis we have identified a wide range of methods in the field of persuasion. This influences the scope of our review, which means that we do not look outside of the field in our literature research. Broadening the scope of the literature review can be a topic for further research.

As mentioned above, we limit our research study to the papers presented at the Persuasive Technology Conference. We do so, because the papers published from here are relevant double blind peer review papers, and they provide a clear body of literature to work with. Many of the leading researchers in the field of persuasion attend those conferences, so we conclude that the most relevant methods within the field will be presented at the conference at some point. This leads us to define the identified methods based solely on the persuasive literature. But what would have happened if we included literature about the identified methods that have not been presented at the conference?

We propose further work should be done in order to understand the origin and use of the identified methods. As we propose that a design approach with a focus on information architecture

might benefit the field, so might other fields as well. Further research can use the identified methods as a scope for a new literature review. Understanding the specific approaches based on the way they are described outside the field of persuasion can help to see if there are aspects from their application elsewhere that can support the field of persuasion.

If literature beyond the conference is included in a further literature review, it might also be an advantage to the methods already found in our analysis. The literature beyond the conferences might among other things, be able to support the description of the methods, which might make it possible to make the description even more exact in future work.

We find it very interesting to wonder what our literature study would have showed us, if we had decided to do an extended literature review in this thesis, which includes literature beyond the conference literature we included.

## 7.3 Characteristics of case-specific methods

We have already proposed how we can empirically test our proposed method, but can it also be expanded by the literature?

When we make our literature review, we have to make some choices while doing it, in order to identify the relevant literature. Many of these choices are made while we are working with the literature in NVivo. As mentioned in section 3.3.1, we use nodes to narrow the papers down to only the ones relevant for our thesis. While performing our literature review we narrow the amount of papers down in four rounds by using the nodes:

- Method vs. Theory
- Design vs. Evaluation
- General method vs. Case-specific method
- General methods

Since our thesis is focusing on methods, we do not consider the theoretical papers, which is why we are excluding them. In further research, it will be interesting to look into, how the results will look if all the methods in the 340 papers are included and not just the methods, which can be applied no matter the case. We know for a fact that we excluded 148 papers, because they were case-specific. If all those papers are included, there will be a lot more methods, which can be considered in further research. Most of the methods presented or mentioned in the case-specific papers, are only used one time, since it is specifically addressed to the paper's case. However, it could be interesting to find out if the case-specific methods have any characteristics and how they are used.

8 Conclusion
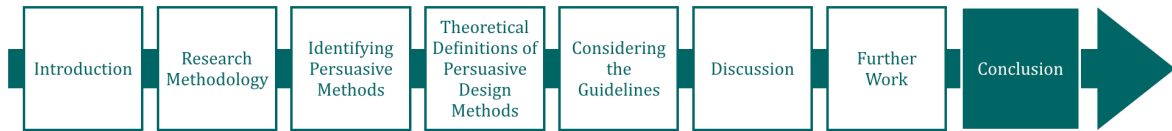
Based on the conducted literature review, the following consideration of the theory of persuasive design and information architecture and the proposed method based on these considerations, we can now conclude on the results of this thesis.

The thesis was guided by the research questions:

How can a method for design and evaluation of persuasive technologies accommodate the issues identified when applying the PSD model?

- *What characterizes the methods used within the field of persuasive design?*
- *In which ways may information architecture contribute to a persuasive technology method?*

To answer what characterizes the methods used within the field, we first conducted a literature review with a focus on identifying the methods used within the field of persuasion, to design and evaluate persuasive technologies. The review helped us to identify 16 methods. These are the methods described in the literature, which can be used to guide a design or evaluation process of a technology, regardless of what case you are working on. The literature review showed that within the field of persuasion, there are almost equally as many papers using methods to guide design processes, as there are papers using methods for evaluation.

To get a better understanding of the patterns within the field and the approaches used, we used the Sanders Research Design Landscape to sort the identified methods into what mindset and approach they seemed to belong in. This was done based on the way they were presented and used in the literature. The synthesis showed that the field of persuasive design favors the research-led approach and applies an expert mindset. 10 methods were placed within this quadrant of the landscape. What characterizes the methods within this quadrant, is that the designers are the experts and do not involve the users in the design process – besides involving them in the research. Only two methods were placed in the quadrant for the design-led approach with an expert mindset. They are also characterized by having the designers as the experts, but they focus on iteration through the design and using a framework for designing. There were three methods in the design-led approach with a participatory mindset. The three methods are characterized by focusing more on the design than the research and involving the users in the design process through e.g. inspiration cards. The last quadrant is the research-led approach with a participatory mindset and only one method was placed here. The method is characterized by

including the users in the evaluation process, but their feedback is still being evaluated by experts based on research.

In order to understand how information architecture and persuasion can support each other we took a step back and considered what would characterize a method based on the theory of persuasion and information architecture. We made the connection between the two fields by looking into rhetoric. Persuasion as a term has its roots within rhetoric, but we argue that so do information architecture. The same way rhetoric is about the structure of a beautiful argument, information architecture is about structuring information in a way that is understandable and findable for the user. This connection became clearer when we considered the five disciplines of rhetoric, with the components of information architecture.

Based on this common background in rhetoric, we therefore propose nine guidelines based on the two fields, proposing what a method for designing or evaluating persuasive technologies should include. The guidelines are partly based on persuasion theory and information architecture. The guidelines from information architecture add requirements for a method to consider organization, labeling and navigation systems when adding persuasion to a technology. It further requires a designer to consider the relationship between the user, content and context. These guidelines are not a method in themselves, as there is no process or consideration of the order in which they are presented. Instead they are the background for the further analysis of the identified methods.

For each guideline we identified which methods fully included, mentioned or did not include it. We found that the methods each fully included between zero to five guidelines, with the majority only considering two guidelines. For one of the guidelines, no method was fully including it, while another was included in 7 methods. The other guidelines were considered by one to four methods.

This showed us that none of the identified methods were fitting by themeselves. The method that considered the most guidelines were the EDIE method, which we then chose as a base for our proposal of a new method that would consider all the guidelines. We also used the Persuasive System Design model, the Fogg Behavior Model and the Behavior Change Wheel methods, as they included considerations of the guidelines that the EDIE method did not.

Based on these existing methods we proposed the DEDE method. Consisting of four phases, the purpose of this method is to ensure that a technology is fitting with the definition of persuasion. In the first phase, Define, you define the intent of the technology as well as consider who you are defining for and if these two are compatible. If not, the method has a stop block, saying that you cannot continue the process. For the second phase, Explore, you go more into understanding the context and at what moment the persuasion can happen. If this is not possible then the method tells you to stop, to limit the risk of doing anything other than persuasion. The designer can then move into the Design phase, in which the components of information architecture are now combined with the principles of persuasion. The final phase, Evaluation, in which to consider the long-term influence of the technology, is about ensuring that the technology is empowering the

user and not making them dependent on the technology. At the same time, this is also where you would consider any possible negative or unintended uses of the technology.

We acknowledge that this method is not yet empirically tested, and its effectiveness is therefore not proved. However, as the method is based on an extensive literature review of the field and methods that already have been used, it is therefore not unfounded. Based on this thesis we propose different types of further work, like testing of the proposed method, further analysis of the identified methods and a broader literature review, to gain a broader understanding of our results.

We believe that the process and content of the DEDE method accommodate the issues identified in the Persuasive System Design model. This is done by placing a bigger focus on connecting the different steps and proposing a specific process that needs to be followed. The incorporation of two stop blocks limits the risk of the method being used just as a checklist, without considera-tion of the user and their context - and whether persuasion is even applicable.

9 Literature

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Appendix 1 – Overview of figures

Appendix 2 – Overview of tables

Appendix 3 – What Makes it Persuasive?

What Makes It Persuasive?

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Abstract. Based on an analysis of two wearable activity trackers, this papers seeks to contribute to the discussion of characteristics of persuasive design, by arguing that although principles commonly applied in persuasive technologies are present, it may not justify that a technology is defined as persuasive. We refer to the rhetorical concept of peithenanke, in order to explain the subtle nuances of different types of behaviour design, and support previously made arguments that transparency and ethics are fundamental qualities of persuasion, which should not be overlooked neither in theory nor in practice.

Keywords: Persuasion · Persuasive design · Children · Ethics
Peithenanke

1 Introduction

Although persuasion in modern days is most often considered in relation to social psychology, the concept is recognized as being traceable to ancient Greece, the source of not only democracy but also classical rhetoric. Persuasion was central to Aristotle's theory of rhetorical discourse, and the concept remains a dominant tradition in the rhetorical tradition, distinguishing itself from other rhetorical traditions such as politics and marketing [1].

In this paper, we address some of the nuances which constitute subtle yet significant distinctions of persuasion, and discuss these in relation to persuasive technologies. Particular interested is directed towards the persuasive intentions as well as towards the distinction between persuasion and less ethical approaches to influencing the receiver – in classical rhetoric referred to as *peithenanke*. The presented reflections are brought about by a comparative analysis of two wearable activity trackers, from which it was found that often referenced persuasive principles [2, 3] were heavily applied in both systems, but that only one of the trackers might in fact be considered persuasive, when considering the rhetorical nuances of the concept. The persuasive potential of activity trackers is generally acknowledged, however the particular interest of this paper, is the challenges related to devices designed for children – and to discuss whether such devices can in fact be defined as persuasive.

Overall, the goal of this paper is to contribute to the ongoing research and practice in design and evaluation of persuasive technologies, by addressing some of the challenges related to classifying a system as being persuasive. Moreover, we introduce the

rhetorical concept peithenanke, and argue that the rhetorical distinction between pei-thenanke and persuasion may be an important element to consider when evaluating persuasive systems.

2   Family Wearables – A Comparative Analysis of Persuasive Potential

During the past decade, health has been the dominating domain for research and development of persuasive technologies. A review of full papers published in the first decade of Persuasive Technology conferences, indicated that 41 out 133 papers were related to different areas of mental and physical health. Over time, persuasive appli-cations supporting a healthier lifestyle has advanced from simple pedometers and web based diaries for training and diets, to wearable devices and mobile applications which not alone facilitate users in achieving a healthier lifestyle, but also enable them to connect and integrate their activity tracking with additional applications such as cal-endars, mobile phones and streaming services.

Wearable activity trackers are generally understood as electronic devices which enable the user to monitor physical activity such as walking and running. While early versions of wearable activity trackers mostly targeted ambitious fitness enthusiast aiming to track e.g. their exercise pulse, speed and distance, resent years have shown a developing tendency for activity trackers which target a far wider range of users. With devices, such as Jawbone and Fitbit, wearable activity trackers have become a common household item which furthermore not only provides the user with health-related metrics, but also aim to motivate the user to persuade the user to become even more active. On a more resent scale, wearable activity trackers are now being developed for children, providing them with some of the fundamental features of the adult trackers, but modified in an attempt to meet the practical and motivational requirements of children (e.g. higher durability and use of animations).

In this study, 2 activity trackers (Garmin VivoSmart HR and Garmin Vivofit Jr.) were evaluated and compared in order to identify which persuasive features were incorporated and what parts of the system were seen to have the most significant persuasive impact. The activity trackers are primarily distinguished from each other by the intended users. While the Garmin VivoSmart HR is aimed at adults, the Vivofit Jr is an activity tracker designed for children. Equal for both trackers is that the system consists of the wearable activity tracker (bracelet) and a designated app for mobile devices[1]. Both technologies aim to motivate the user to be more physically active, by tracking activities and providing the user with statistical feedback and motivational triggers. E.g. the Garmin HR will (like many other activity trackers) prompt the user to move regularly, and praise the user when specific goals have been met. The Vivofit Jr. bracelet on the other hand combines activity tracking with assigned chores, and is presented by Garmin as an activity tracker which *"motivates kids with rewards and a mobile adventure trail to unlock"* (Fig. 1).

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[1] https://buy.garmin.com/da-DK/DK/cIntoSports-c571-p1.html.

Fig. 1. On the left, the Garmin VivoSmart HR, and on the right, Garmin Vivofit Jr

3   Analysing Devices with the PSD Framework

The PSD model [3] was applied as methodological framework for the system evaluation. The evaluation itself was conducted as a group exercise involving both persuasive design experts and information architecture students at Master's levels. Conducting the analysis as a group activity involving different types of expertise, was considered beneficial as the different features of the two systems were more richly discussed. An important element of the PSD model is the encouragement to include an analysis of the intended use and the user context. This was found particularly important to our study as the devices where very similar, and predominantly distinguished by their target users. The evaluation of each system considered the different elements of the PSD framework stringently, and the findings were subsequently compared and discussed. In order to identify where in the system persuasive features are applied, the analysis distinguishes between findings in the mobile app and findings in the wearable activity tracker. To further support the evaluation results, interviews were conducted with 4 adult users and 4 children who were familiar with the two devices. In the following, a very brief overview of the analytical findings is provided. The main goal is to illustrate the extensive commonalities between the two systems, prior to discussing their actual persuasive potential.

3.1   Persuasion Context

Activity trackers are generally applied by user's who wish to increase or monitor their existing level of physical activity. Garmin VivoSmart HR. and similar devices are most often used by adults or young adults who independently make the decision to apply the technology based on an intention to become healthier or increase physical activity. these intentions are seldom shared by children who wear the Garmin Vivofit Jr. For the most part, the decision to provide the child with an activity tracker will be made by an adult, and the intent to increase physical activity is not necessarily shared by the child. Both technologies are meant to be used both day and night, thereby enabling the user to acquire feedback not only about physical activity but also sleep patterns. Whilst the Garmin HR require weekly charging, the Garmin Vivofit Jr requires no charging as the battery will last for approximately 1 year.

An important difference between the two systems, is that whilst they both provide extended feedback through the mobile apps, the Garmin HR app is applied by the user, whilst the Garmin Vivofit Jr app is parentally controlled. Moreover, while the Garmin HR enables the user to integrate content from other health related mobile apps, the Garmin Vivofit Jr is a more closed system. Competition with other users is only possible if the users are connected to the same parental control app (e.g. siblings). Finally, The Garmin Vivofit Jr not only focuses on activity but also on chores, such as doing homework, cleaning room, walking the dog etc. Completed chores can then be rewarded with virtual goal coins.

3.2 Primary Task Support

The primary task support constitutes principles which facilitate the targeted behaviour change. For both technologies, the primary task is identified as supporting the user in increasing physical activity on a daily basis. In our analysis, we focused on identifying which persuasive principles were applied, and in what part of the system (tracker or app) (Tables 1 and 2).

Table 1. Overview of analysis of primary task support principles in Garmin VivoSmart HR

Garmin VivoSmart HR			
Persuasive principle	Example	Tracker	App
Reduction	Complex data is presented in simple visualisations	X	X
Tunnelling	Registration with Facebook, then automatically connected via Bluetooth		X
Tailoring	Activity goals are set individually by the user. User defines what information to be presented in the app and the bracelet	X	X
Personalisation	User name and profile picture + connection to Facebook. Bracelet enables user to receive text messages and email	X	X
Self-monitoring	Steps, stairs, sleep and pulse can be measured. Data is presented for individual days as well as progress over time	X	X
Simulation			
Rehearsal			

As indicated in the tables, the majority of principles categorized as primary task support, was identified in both systems. In most cases the principles were applied in the same manner and with very few adjustments to indicate that one tracker was targeted children. Moreover, it was considered noticeable that while simulation and rehearsal was not identified in the VivoSmart system, all principles within the category was identified in the Vivofit Jr device.

Table 2. Overview of analysis of primary task support principles in Garmin Vivofit Jr

Garmin Vivofit Jr			
Persuasive principle	Example	Tracker	App
Reduction	Complex data is presented in simple visualisations	X	X
Tunnelling	Registration requires name and picture, everything is automatic		X
Tailoring	Goal is pre-set for 60 min of daily activity. Chores and rewards are customized in the app	X	X
Personalisation	App has picture of the child, and provides the option to select different colours and customize the app avatar. Name of the user appears on the tracker	X	X
Self-monitoring	Steps and number of coins are visible on the tracker, as well as number of active minutes and completed chores	X	X
Simulation	Coin falls into piggybank	X	
Rehearsal	Same chores are completed every day and activity goal is always 60 min	X	X

3.3 Dialogue Support

The dialogue support constitutes principles which facilitate the communication between the user and the system. Dialogue support particularly aims to maintain user motivation, during the persuasive process (Tables 3 and 4).

Table 3. Overview of analysis of dialogue support principles in Garmin VivoSmart HR

Garmin VivoSmart HR			
Persuasive principle	Example	Tracker	App
Praise	Device vibrates when goals are achieved	X	
Rewards			
Reminders	Device reminds user to be active if no activity has been registered for 1 h. User is reminded when the device need to be recharged	X	
Suggestion	Suggestions are provided regarding ways in which the app may be customized		X
Similarity	The design is simple and discrete, thereby being identified as appropriate for everyday use. The app provides an overview of collected data and a neutral presentation of data analysis	X	X
Liking			
Social role	Coach – presentation of data. Assistance in goal setting, motivation and reminders	X	X

Table 4. Overview of analysis of dialogue support principles in Garmin Vivofit Jr

Garmin Vivofit Jr			
Persuasive principle	Example	Tracker	App
Praise	Happy tune when the 60 min are up	X	
Rewards	Coins in piggybank and steps on jungle track	X	X
Reminders			
Suggestion	The app provides suggestions for chores that might be appropriate for the child		X
Similarity	Child friendly avatars and an element of gamification. Piggybank is known by most children, the app has a game like jungle track, and the same ikons are applied throughout the system	X	X
Liking	Happy colours, child friendly ikons. App is highly ikon driven and very simple in its design	X	X
Social role	The appears to take the role of communication facilitator. It eases the dialogue between parents and children, as goals and chores are visualised clearly		X

Dialogue support is identified in both technologies, particularly in terms of praise and rewards. The dialogue support is not limited to verbal feedback, but also physical as the wearable device vibrates when goals are achieved. Reminders are provided through e.g. prompts that the user should move or be active.

While the Garmin HR adopts the social role of a personal trainer, providing feedback on exercise and progress, the Garmin Vivofit Jr is designed in a more game oriented manner, highlighting when the user earns gold coins for completing tasks, and by supplying the user with a game avatar which creates a link to the design of the mobile app. Due to the comprehensive parental control, the Vivofit Jr was identified as a communication facilitator rather than a direct coach or guide for the child.

With regards to the Garmin Vivofit Jr., it was noted that the wearable device itself provides very little feedback for the child. As the mobile application is controlled by the parent, the actual user is provided with very little insight or system transparency. Although the child is provided with information about number of steps completed during a day, the reward is not achieved before the child is provide access to the mobile app, where the steps then enable the child to proceed with a virtual jungle trail. Rewards provided through the wearable device are constituted by virtual coins which the child may earn by completing different chores – chores which have been defined by the parents, and coins which are awarded by the parents rather than the system.

3.4   Credibility Support

Beyond system functionality, credibility is considered a key component in persuasive systems. Harjumaa et al. [4] clarify that credibility may be based on either the manufacturers brand or embedded in the system design. While Garmin is recognized

internationally as a highly credible brand in relation to activity trackers, it is by far the only recognized brand. With producers, such as Fitbit, Jawbone and Samsung amongst others also providing users with high quality trackers, the choice of trackers is assumed to very often be based on characteristics such as connecting mobile device (e.g. android vs apple devices, or a wish to connect a Samsung tracker to a Samsung phone for better functionality). Consequently, although acknowledging the brand value in relation to credibility, our analysis has focused more specifically on design based credibility (Tables 5 and 6).

Table 5. Overview of analysis of credibility support principles in Garmin VivoSmart HR

Garmin VivoSmart HR			
Persuasive principle	Example	Tracker	App
Trustworthiness	In general, there is a tendency to trust information from our own phones. The data appears to be detailed and it is possible to test that steps are counted correctly	X	X
Expertise	Garmin is a recognised brand which facilitates the impression of expertise	X	X
Surface credibility	The tracker design appears robust, and professional. The app provides a wide range of information although the visible design is somewhat confusing	X	
Real-world feel			
Authority	Imperative form is applied for messages. Recommendations are very clear. Step goals are not customizable but pre-set based on past days' activity	X	X
Third-party endorsement	Possible to connect to other users through different apps. E.g. Endomondo or Lifesum		X
Verifiability	It is possible to verify if step counting is correct. When connected to other apps, it is possible to verify e.g. distance	X	

Table 6. Overview of analysis of credibility support principles in Garmin Vivofit Jr

Garmin Vivofit Jr			
Persuasive principle	Example	Tracker	App
Trustworthiness	Step count and systematic overview of chores and coins is easily interpreted even by children	X	X
Expertise			
Surface credibility	Tracker is robust and child friendly with no sharp edges. The app is very simple and offers help and guidance	X	X
Real-world feel			
Authority			
Third-party endorsement			
Verifiability			

In the analysis of credibility support, it is particularly noticeable that the majority of principles are identified in the Garmin VivoSmart system. Although recognising that credibility support in general is a significant factor in persuasive system design, it does appear natural that these principles are not heavily applied in a device designed for children, as the intended users are unlikely to weigh them as heavily as adult users.

3.5 Social Support

The final category, social support, is based on Fogg's original principles regarding mobility and connectivity [5]. Fogg argues that networked devices may to facilitate social support, and potentially be more persuasive than technologies that are not connected (Tables 7 and 8).

Table 7. Overview of analysis of social support principles in Garmin VivoSmart HR

Garmin VivoSmart HR			
Persuasive principle	Example	Tracker	App
Social learning			
Social comparison	Compares results to other Garmin users or other trackers through compatible apps		X
Normative influence			
Cooperation			
Social facilitation			
Competition	It is possible to challenge and compete with other users once connected		X
Recognition			

Equal for both devices, social support principles are only scarcely applied. For the VivoSmart HR device, there is an option to share data with others, however the system does not push for the user to do so. We interpret this as a sign of respect that for many users, personal weight and level of activity is a somewhat private topic which the user may comfortably share with the device, but not necessarily with other people. Contrary, for the Vivofit Jr. the little use of social support principles is assumed to be based on a higher focus on security as children may not be fully aware of the consequences of sharing personal information with others. Therefore, sharing is only possible through the mobile app and is as such parentally controlled. Overall, the analysis of the two systems demonstrate an extensive application of persuasive principles, particularly in the categories Primary Task Support and Dialogue Support. Differences are subtle as the principles are often applied in identical manners, it is however noticeable that there is a slight majority of persuasive principles applied in the Vivofit Jr compared to VivoSmart HR.

Table 8. Overview of analysis of social support principles in Garmin Vivofit Jr

Garmin Vivofit Jr			
Persuasive principle	Example	Tracker	App
Social learning			
Social comparison	It is possible to compete with other family members on number of steps		X
Normative influence			
Cooperation			
Social facilitation			
Competition	The system provides step challenges and comparison through the app		X
Recognition	The tracker is eye catching and easily recognised by other children in school	X	

4 What Makes It Persuasive?

In spite of the analysis identifying vast commonalities between the two devices, and in spite of persuasive principles being distinctly identified in both activity trackers, the persuasiveness of the Garmin Vivofit Jr. activity tracker was found to be challenged when further considering the intent of applying the device and the transparency of the mobile application. In particular, the parental control of the Garmin Vivofit Jr app imposed challenges, as the majority of persuasive principles were identified in the app, and did as such not necessarily reach the actual user. Moreover, the majority of praise and rewards attained through the activity tracker was related to the chores, rather than to being physically active. Consequently, the potential to motivate children to be more physically active, was found to be surpassed by the more dominating focus on completing chores in order to earn gold coins and eventually receive rewards in real life. The most important challenge however, was found in the overall feedback of the system, which both in relation to chores and in relation to physical activity, primarily focuses on the rewards systems rather than on the targeted behaviour change.

Our reason to contest the persuasiveness of the Vivofit Jr, was further supported by interviews conducted with a group of children and parents who have experience with the device. The group involved 4 children who all used the device, and 2 sets of parents. In all instances, the devices were introduced to the children by parental imitative. In one case, a child had wished for a tracker after being inspired by a sibling who had already been given one. While the parents indicated that the trackers had been given to the children with the intent to motivate more physical activity, the children all stated that their main focus in the system was the rewards in terms of virtual coins in the piggybank. The children showed was very little interest in the jungle track, and neither the children nor the parents had experienced a continuous increase in physical activity amongst the children. On the contrary, one set of parents explained that the activity tracker had made them aware that their children were already extremely active during their school days, and as such it became more acceptable that they felt a need to

relax and play with e.g. an IPad once they came home. As such, it appeared that the Vivofit Jr, in spite of a vast use of persuasive principles, had very little persuasive impact in practice, and after a while served more as a parent surveillance tool and a digital resource for rewarding the child when chores had been completed.

Consequently, in spite of the analysis of the Garmin Vivofit Jr. resulting in contradictory results the system is found to not be genuinely persuasive, but rather an example of what is in learning theories referred to as *chocolate covered broccoli* [6]. Rather than have the system motivate and encourage children to be more active, chores and physical activity is made appealing through virtual rewards and animations, comparable to when children are tricked into eating medicine, simply by disguising it in something pleasant such a yoghurt.

In continuation, we refer to distinctions of the concept of persuasion, primarily addressed through classical rhetoric. Rhetoric is understood as the art and science of beautiful communication – in the sense that communication should be not only appealing but also efficient and truthful [7]. In classical rhetoric, persuasion is understood to be an approach to attitude and behaviour change with particularly high ethical standards, as opposed to the concept *peithenanke* which indicates manipulation, or force masked as persuasion [8]. It is important to note however, that in classical rhetoric, truth is considered a far wider concept than for instance logic as the perception of truth is to some extent based on sentiment rather than fact alone [9]. Direct lies are still discarded as untruthful, however classical rhetoric does acknowledge that in some cases, the perception of truthfulness depends on the context and on the rhetorical strategy – a challenge which is well known in e.g. politics, marketing and commercial settings. In contrary, persuasion is argued to distinguish itself through transparency, understood in the sense that the persuadee is fully aware that his or her attitude or behaviour is being changed.

Identifying persuasion as a more ethical approach to behaviour design is by far novel to the persuasive technology community. In a critical review of Fogg's original publication on persuasive technologies [2], Atkinson argues that in order for persuasive technologies to be ethical, some level of transparency is required [10]. Transparency is understood in the sense that users must be aware of the persuasive intent of the technology. Beyond the persuasive conference community, similar arguments have been made by Berdichevsky and Neunschwander (1999), as they stressed that true persuasion does not misinform the user, and that ethical evaluations should include not only the consequences of the persuasive technology but also evaluations of the persuasive intent [11].

To further elaborate on our perception of persuasiveness in comparison to peithenanke, we refer to Spahn's ethical guidelines for persuasive systems:

1. Persuasion should be based on prior (real or counterfactual) consent
2. Ideally the aim of persuasion should be to end the persuasion.
3. Persuasion should grant as much autonomy as possible to the user [12]

In the case of the Vivofit Jr, the problems appear to be multiple. Firstly, the intent of the device is argued to be motivating children to be more physically active, whilst the actual design of the tracking device places a primary focus on the chores and appurtenant rewards, thereby failing to facilitate the primary intention. Secondly, the

motivational aspect of the design and the predominant focus on rewards rather than facilitation of knowledge processing regarding progress and health benefits, challenges the persuasiveness as the child is unlikely to identify the intent of the system making it doubtful that the system will result in the child maintaining the intended level of activity and consequently making the persuasive device superfluous [12, 13]. Thirdly, the parental control of the system provides the child with almost no autonomy or ability to consent to the data being collected. While we recognise the safety-concerns leading to this particular element of the design, we find that it gives reason to consider if in fact children can ever be persuadees, before they have the maturity to recognise the implications of the system they are interacting with.

5   Reflections for Future Research

In this paper, we have sought to illustrate that while an analysis of two activity trackers immediately resulted in the impression that they could both be categorized as persuasive systems, the actual persuasiveness is to some extend dependent on the several other factors beyond the distinct system features. To elaborate on the challenges related to identifying a system as being persuasive, we point towards classical rhetoric as well as modern research within the field of persuasion. We find that although some of these thoughts have been presented and discussed previously, they constitute perspective which remains continuously important to revisit, as digital resources become increasingly more pervasive, and as different approaches to behaviour design are constantly emerging. With the dawn of social media, wearable technologies for both adults and children and a constantly increasing use of digital communication platforms in everyday life, we are likely to find that transparency as well as ethics of design and application in general, is challenged. Based on our findings we recommend that future research involves exploring the possibilities and limitations of children as persuadees. The subject has seldom been considered within the persuasive technology community, however with a continuous increase in systems that target a younger audience (e.g. Pokémon Go [14]) we find it to be an important element to consider. In terms of our methodological approach to this research, we found that the PSD model provided a well-structured and systematic framework. However, in our interpretation of the framework, it may be beneficial if the Persuasion Context, is to be considered a reflection benchmark to which all other analytical findings should be related – and potentially a preclusion for further analysis in order to avoid that all interactive systems will potentially be considered persuasive.

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Appendix 4 – Persuasive System Design Principles

The categories for persuasive system principles suggested in this article are primary task, dialogue, system credibility, and social support.

The design principles in the primary task category support the carrying out of the user's primary task. The design principles in this category are reduction, tunneling, tailoring, personalization, self-monitoring, simulation, and rehearsal. See Table 2.

Table 2. Primary Task Support

Principle	Example requirement	Example implementation
Reduction A system that reduces complex behavior into simple tasks helps users perform the target behavior, and it may increase the benefit/cost ratio of a behavior.	System should reduce effort that users expend with regard to performing their target behavior.	Mobile application for healthier eating habits lists proper food choices at fast food restaurants [Lee et al. 2006]. Smoking cessation Web site provides an interactive test that measures how much money a user will save with quitting.
Tunneling Using the system to guide users through a process or experience provides opportunities to persuade along the way.	System should guide users in the attitude change process by providing means for action that brings them closer to the target behavior.	Smoking cessation Web site offers information about treatment opportunities after a user has taken an interactive test about how addicted (s)he is on tobacco.
Tailoring Information provided by the system will be more persuasive if it is tailored to the potential needs, interests, personality, usage context, or other factors relevant to a user group.	System should provide tailored information for its user groups.	Personal trainer Web site provides different information content for different user groups, e.g. beginners and professionals. Web site for recovering alcoholics presents stories that are close to the user's own story.
Personalization A system that offers personalized content or services has a greater capability for persuasion.	System should offer personalized content and services for its users.	Arguments most likely to be relevant for the user presented first on a professional Web site rather than in random order.
Self-monitoring A system that keeps track of one's own performance or status supports the user in achieving goals.	System should provide means for users to track their performance or status.	Heart rate monitor presents a user's heart rate and the duration of the exercise. Mobile phone application presents daily step count [Consolvo et al. 2006].
Simulation Systems that provide simulations can persuade by enabling users to observe immediately the link between cause and effect.	System should provide means for observing the link between the cause and effect with regard to users' behavior.	Before-and-after pictures of people who have lost weight are presented on a Web site.
Rehearsal A system providing means with which to rehearse a behavior can enable people to change their attitudes or behavior in the real world.	System should provide means for rehearsing a target behavior.	A flying simulator to help flight pilots practice for severe weather conditions.

Any interactive system provides some degree of system feedback to its users, potentially via verbal information or other kinds of summaries. There are several design principles related to implementing computer-human dialogue support in a manner that helps users keep moving towards their goal or target behavior. They include praise, rewards, reminders, suggestion, similarity, liking, and social role. See Table 3.

Table 3. Dialogue Support		
Principle	Example requirement	Example implementation
Praise By offering praise, a system can make users more open to persuasion.	System should use praise via words, images, symbols, or sounds as a way to provide user feedback information based on his/her behaviors.	Mobile application that aims at motivating teenagers to exercise praises user by sending automated text messages for reaching individual goals. [Toscos et al. 2006]
Rewards Systems that reward target behaviors may have great persuasive powers.	System should provide virtual rewards for users in order to give credit for performing the target behavior.	Heart rate monitor gives users a virtual trophy if they follow their fitness program. Game rewards users by altering media items, such as sounds, background skin, or a user's avatar according to user's performance. [Sohn and Lee 2007]
Reminders If a system reminds users of their target behavior, the users will more likely achieve their goals.	System should remind users of their target behavior during the use of the system.	Caloric balance monitoring application sends text messages to its users as daily reminders. [Lee et al. 2006]
Suggestion Systems offering fitting suggestions will have greater persuasive powers.	System should suggest that users carry out behaviors during the system use process.	Application for healthier eating habits suggests that children eat fruits instead of candy at snack time.
Similarity People are more readily persuaded through systems that remind them of themselves in some meaningful way.	System should imitate its users in some specific way.	Slang names are used in an application which aims at motivating teenagers to exercise. [Toscos et al. 2006]
Liking A system that is visually attractive for its users is likely to be more persuasive.	System should have a look and feel that appeals to its users.	Web site that aims at encouraging children to take care of their pets properly has pictures of cute animals.
Social role If a system adopts a social role, users will more likely use it for persuasive purposes.	System should adopt a social role.	E-health application has a virtual specialist to support communication between users and health specialists. [Silva et al. 2006]

The design principles in the system credibility category describe how to design a system so that it is more credible and thus more persuasive. The category of system credibility consists of trustworthiness, expertise, surface credibility, real-world feel, authority, third-party endorsements, and verifiability. See Table 4.

The design principles in the social support category describe how to design the system so that it motivates users by leveraging social influence. The design principles that belong into this category are social facilitation, social comparison, normative influence, social learning, cooperation, competition, and recognition. See Table 5.

Table 4. System Credibility Support		
Principle	Example requirement	Example implementation
Trustworthiness A system that is viewed as trustworthy will have increased powers of persuasion.	System should provide information that is truthful, fair and unbiased.	Company Web site provides information related to its products rather than simply providing biased advertising or marketing information.
Expertise A system that is viewed as incorporating expertise will have increased powers of persuasion.	System should provide information showing knowledge, experience, and competence.	Company Web site provides information about their core knowledge base. Mobile application is updated regularly and there are no dangling links or out-of-date information.
Surface credibility People make initial assessments of the system credibility based on a firsthand inspection.	System should have competent look and feel.	There are only a limited number of, and a logical reason for, ads on a Web site or mobile application.
Real-world feel A system that highlights people or organization behind its content or services will have more credibility.	System should provide information of the organization and/or actual people behind its content and services.	Company Web site provides possibilities to contact specific people through sending feedback or asking questions.
Authority A system that leverages roles of authority will have enhanced powers of persuasion.	System should refer to people in the role of authority.	Web site quotes an authority, such as a statement by government health office.
Third-party endorsements Third-party endorsements, especially from well-known and respected sources, boost perceptions on system credibility.	System should provide endorsements from respected sources.	E-shop shows a logo of a certificate that assures that they use secure connections. Web site refers to its reward for high usability.
Verifiability Credibility perceptions will be enhanced if a system makes it easy to verify the accuracy of site content via outside sources.	System should provide means to verify the accuracy of site content via outside sources.	Claims on a Web site are supported by offering links to other web sites.

Even if the design principles in the primary task support category are based on the works of Fogg [2003], there are also many differences from them. The key benefit of suggestion is meaningful content for the user rather than providing support for carrying out a process or making a task simpler to do. For this reason, it is tackled in the dialogue support category. In our view, surveillance and conditioning are not acceptable means for persuasive systems. Oftentimes people cannot choose whether they may be observed or not, which easily leads to covert approaches. In a similar manner, operant conditioning oftentimes is not open. Moreover, we also think that users act more or less rationally in how they form and modify attitudes, on the basis of beliefs and values rather than performing behavior as a result of conditioning.

The design principles related to dialogue support are partly adopted from Fogg's ideas on social actors (attractiveness, similarity, and praise) and media (virtual rewards). Reminders and social role suggest new design principles, whereas the idea of reciprocity was excluded from this framework because it is a characteristic of a user rather than a system feature.

The differences between the design principles in the system credibility category and the functional triad are that this category excludes the system fulfilling users' positive expectations as well as the ideas of responsiveness, ease-of-use, and error-freeness, because they belong to the postulates. Since personalization is very closely related to

tailoring, it can be found at the primary task category. On the other hand, the key benefit of referring to an authority is to increase system credibility in a manner similar to other principles in this category. Presumed credibility, reputed credibility, and earned credibility influence users, doubtless even more than many of the abovementioned principles much of the time, but since these can not really be represented as system features, they are excluded.

Table 5: Social support		
Principle	Example requirement	Example implementation
Social learning A person will be more motivated to perform a target behavior if (s)he can use a system to observe others performing the behavior.	System should provide means to observe other users who are performing their target behaviors and to see the outcomes of their behavior.	A shared fitness journal in a mobile application for encouraging physical activity [Consolvo et al. 2006].
Social comparison System users will have a greater motivation to perform the target behavior if they can compare their performance with the performance of others.	System should provide means for comparing performance with the performance of other users.	Users can share and compare information related to their physical health and smoking behavior via instant messaging application [Sohn and Lee 2007].
Normative influence A system can leverage normative influence or peer pressure to increase the likelihood that a person will adopt a target behavior.	System should provide means for gathering together people who have the same goal and make them feel norms.	A smoking cessation application shows pictures of newborn babies with serious health problems due to the mother's smoking habit.
Social facilitation System users are more likely to perform target behavior if they discern via the system that others are performing the behavior along with them.	System should provide means for discerning other users who are performing the behavior.	Users of a computer-based learning environment can recognize how many co-students are doing their assigned homework at the same time as them.
Cooperation A system can motivate users to adopt a target attitude or behavior by leveraging human beings' natural drive to co-operate.	System should provide means for co-operation.	The behavioral patterns of overweight patients are studied through a mobile application, which collects data and sends it to a central server where it can be analyzed at the group level in more detail [Lee et al. 2006].
Competition A system can motivate users to adopt a target attitude or behavior by leveraging human beings' natural drive to compete.	System should provide means for competing with other users.	Online competition, such as Quit and Win (stop smoking for a month and win a prize).
Recognition By offering public recognition for an individual or group, a system can increase the likelihood that a person/group will adopt a target behavior.	System should provide public recognition for users who perform their target behavior.	Names of awarded people, such as "stopper of the month," are published on a Web site. Personal stories of the people who have succeeded in their goal behavior are published on a smoking cessation Web site.

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