Information Architecture and Persuasive Design: mutual benefits in theory and practice

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Denis Nikolaev Damyanov

Abstract

This project set out to explore the combination of the knowledge fields Information Architecture and Persuasive Design both in theory and practice. The process went through *research*, *strategy* and *design* stages for exploring existing systems and development of a new one. The *research* phase included analysis of the information architecture context, supported by identification of the persuasion context. In addition, the it explored the content and users of the information environment, and evaluated existing systems in order to identify successful and unsuccessful characteristics of previous versions. The research also established an understanding of user viewpoints, behaviors and experiences with the system, as well as their motivations to be part of a community. This resulted in the formation of a *strategy,* which consisted of design requirements for the development of the new information environment. As a result, the project advanced through a *design* process of implementing knowledge based on research outcomes, which guided the organization of content for the system. Moreover, the project engaged in the design and development of high-fidelity functional prototype, providing a visual of the relationship between the two fields. Finally, the design stage applied persuasive principles in previously identified opportune moments for persuasion, which enhanced the interactivity and the persuasive power of the system, while at the same time providing a process to keep users engaged.

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Table of Contents

5

5

List of Abbreviations

IT	Information Technology
IA	Information Architecture
PD	Persuasive Design
PWAs	Progressive Web Apps
PT	Persuasive Technologies
PSD Model	Persuasive Systems Design Model
RE	Requirements Engineering
UI	User Interface
UX	User Experience
FAQ	Frequently Asked Questions

1. Introduction

This project explores the relationship between two knowledge fields, Information Architecture and Persuasive design, in theory and practice. It aims to understand what each field brings to the process and contribute with distinguishing where in the process one field comes stronger than the other, as well as explain their mutual benefit.

Technologies are found in the form of products and processes, aimed at making everyday life of people more simple. We interact with technology everywhere: indoors, outdoors and at any time for various purposes. Information technologies (IT) are the best transmitters of information, since they can contain large amounts of it and to a very large extent open many doors for people to explore. However, the *information* in IT might be too much to handle for people, which is why well structured and relevant information is central for users, while at the same time that information would need to appeal to their interest.

These two ingredients, however, are more often than not overlooked when designing information environments in systems. In pursuance of increasing and retaining usability, systems would require a well structured information and a good level of persuasiveness. Both information architecture and persuasive design fields have a strong relationship with information technology.

Information architecture (IA) is widely characterized as an instrument needed by designers, in the process of building an efficient information system, with consideration of the system users and their information needs (Rosenfeld, L., Morville, P. & Arango, P., 2015). To build the system, information architecture determines the labelling and organization of information, as well as guiding the way users could navigate and search for that information, making the system user-friendly.

On the other hand, *persuasive design* (PD) is a field, which is aimed at persuading users into performing an intent. As defined by Fogg, B. J. (2003), persuasion is *"the attempt to change attitudes or behaviors or both"* without using coercion or deception, while also requiring intentionality. The act would involve a persuader and a persuadee, where the concept of persuasion would occur when attitude and/or behavior change of the persuadee is established (Oinas-Kukkonen, H. & Harjumaa, M., 2009). The field could be employed to effectively reach the system/technology users and capture their attention by making it appealing for instance.

Yet, a system or information environment would require more than just a structure to successfully reach the users, and at the same time, persuading users to perform an intent would need more than just the intent and persuasive elements, in order to reach persuasion. It has been discussed that PD and IA could in fact be part of one process (Hasle, P., 2011). At the same time, persuasion could also take a supportive role for a system, making the user-system interaction easier for the users (Lykke, M., 2009). Currently, however, there is a low number of research done, which looks at how the two fields could benefit an actual design process. This calls for a need for exploration of the way the information architecture and persuasive design fields would work together, and what new knowledge they could deliver when combined.

In this project information architecture would aim at creating a process for understanding the context, content and users of a digital platform. In addition, the field would provide a structural design of an information environment, by breaking down the architecture into four systems: organization, labelling, search and navigation systems. These systems are the puzzle pieces playing an essential role in the construction of a successful information environment, which support usability, findability and comprehension for its users (Rosenfeld, L., Morville, P. & Arango, P., 2015). Furthermore, persuasive design would be used to reinforce the already built structure of the information environment and analyze the persuasion context. It would additionally build up a persuasive layer with the intent of appealing to the users' interests, and aim to inspire people to perform an intent.

1.1 Problem Area

In order to explore the above mentioned fields and demonstrate their relationship, I would work with an actual case, which will involve the development and design of a digital system for the a research community called "Persuasive Technologies".

"Persuasive Technologies" consist of an interdisciplinary research community, which has their aim on design, development and evaluation of technologies. They explore topics regarding changing people's attitudes/behaviors through persuasion, without coercion. They need planning and development of their new digital platform for Persuasive Technologies conference in 2020, promoting the event and increasing the interest of both members of the community and newcomers throughout the course of the year.

As the first key point, the research would require an examination of all the available information in past versions of the conference websites, in order to explore how that information could be improved and included in the new website, according to the user needs. Consequently, the research would require gathering data from the users to better understand their interests and needs in relation to the conference. At the same time the community would need to be able to attract new audience to join and expand, and together contribute to the field of persuasive technologies. With this in mind, another aim would be to determine whether or not their current and previous systems provide sufficient information for non-members with less knowledge about the community. All things considered, the information would also contribute to the development of the new platform, which would support mobile usage and the goal of increasing persuasion in users.

Equally important would be to determine and prioritize the most valuable information for the conference platform at different times throughout the year, in order to illustrate a timeline for when specific information would be required more than other. The project would aim to deliver a clean, structured prototype of the platform, which would serve as a quick access of valuable information in relation to the conference. The platform is a key element that would need to reflect the knowledge gained from relevant information at certain times, as it could also serve as a reminder for important dates and deadlines for users.

I believe that combining the field information architecture (to build a solid structure of the information environment) and the field persuasive design (to add a persuasive layer to the platform to make it interesting and engaging) would together assemble a strong digital platform addressing the goals of the PT community. To accommodate the two knowledge fields, the project will make use of the Progressive Web Apps (PWAs) technology, described in section 1.3, which will address the practical dimension of the thesis. In doing so, I would also contribute with knowledge into how the two fields could work together, demonstrated in a practical design process.

1.2 Problem Formulation

How can Information Architecture and Persuasive design be combined and what are the mutual benefits in theory as well as in practice when designing interactive systems?

Research questions:

• What is the current structure and information of the different website versions?
• What makes people interested in attending the conference?
• How to organize the content according to the user needs?
• How could the platform keep members engaged throughout the year?

1.3 Progressive Web Apps

Before proceeding to the next chapter, I would like to address and describe the technology system this project will be focusing on.

The number of users accessing the internet through the comfort of their smartphones is continuously increasing during the years, and the same goes for the number of mobile apps available. One of the most frustrating things for smartphone users is to browse a website, which is not at the very least responsive when looked through on mobile phone. This would provide bad user experience, since the system might be difficult to navigate or read through, making it look unprofessional. As a result, the system could cause frustration and push the user away.

Since the goal of the project aims at combining information architecture and persuasive design, as well as the need to design a digital platform for the selected case, the focus would fall upon the construction of information environment on a mobile platform. In his book *Mobile Persuasion: 20 perspectives on the future of behavior change*, Fogg, B. J. (2007) has stated that mobile technologies are one of the greatest persuaders of all time since they are always by our side. On a daily basis, people would typically spend more time with their mobile device than with anyone else (Fogg, B. J. & Eckles, D., 2007). The project would use this information to its advantage in the exploration of the relationship between the IA and PD fields. The reason behind the selection of the mobile platform is because it could reach users

everywhere, while at the same time provide incentives in the form of prompts, which allow for persuasion. Fogg (2007) refers to it as the magic wand, which can *"…motivate people to achieve their own personal goals"* (p. 8).

The selected digital platform is relatively new and is called Progressive Web Applications (PWAs). PWAs represent a new type of web apps, directly accessed through the internet browser, without the need for download or installation on mobile device. They combine the flexibility of the web with the benefits of a native mobile application, while progressively enabling new features as the users engage with them, in order to provide an app-like experience for it's users. Every year the chances of users installing native applications decrease, which is why PWAs do not require installation, and are capable of building trust in users and earn their place in the device. Furthermore, PWAs make use of script called "service workers", which allow for offline use, or receiving and displaying push notifications to the users. (Ater, T., 2017)

Websites reach three times as many people compared to mobile apps, however, native apps are more engaging for users compared to websites. The two positive sides of both are represented within PWAs and it is just a matter of time before they take over the mobile world (https://developers.google.com/web/progressive-web-apps/). In fact they have already been used in popular websites such as *Forbes*, *Washington Post*, *Flipboard*, *Twitter Lite* and others (Dube, D., 2019).

PWAs are reliable as they bring great offline experiences, background sync and push notifications, functionalities new to the web, all of which are brought by the script - service workers (Gaunt, M., 2019). They are also fast, in a sense that they could load instantly, especially if saved as a quick link on the screen of the device. Speed is essential for users, as it has been found that 53% of mobile site visitors abandon a page if it takes longer than 3 seconds to load (Wagner, J., 2019). In addition, another strength of this type of technology would be that the cost is less than building a native app for each smartphone type. Finally, PWAs are engaging, with the possibility to involve push notifications, which could prompt the users to take an action or simply inform them about something they consider important.

Lastly, PWAs are intelligent, in a sense that they allow learning about the interests of the users, while also keeping them engaged through relevant notifications. A downside of the PWAs include the inability to access features such as bluetooth, proximity sensors, camera control, contacts and more, which the native applications could access. Nevertheless, for conference events, as well as websites concerned mainly with being informative for their users, PWAs are actually be a very suitable choice.

2. Theory

This chapter would start out by describing the relationship between information architecture and persuasive design, as well as discuss current research on the way the fields can or have been used together in a process. In addition, the chapter will provide a description of the approach and characterize the data collection types used for the specified case. Furthermore, an overview of the process will be presented, in order to frame and visualize each part of the project from start to end.

2.1 The Cross-field

A literature search has been carried out in order to explore the combination of the fields information architecture and persuasive design. The purpose of the search was to understand which aspects of the topic have been previously explored by other researchers and where further investigation might be required. This information will in turn aim to contribute and move the direction of the research forward. Furthermore, the goal of this section is to compare the fields and address current research done related to working with them together, in conjunction with my own understanding of both fields. It would also aim to express what their combination could mean. Before visualizing the findings of their combination by other researchers, the fields' background and overall meaning will be discussed individually to establish ground for understanding.

2.1.1 Background

The terms *information* and *architecture* date back to 1976, when they were used by Richard Saul Wurmans in order to describe the way systems work, as well as to address the necessity of structure for the large amounts of data available (Resmini, A. et al., 2011). Some of the disciplines upon which the field is based on include information design, visual design, cognitive psychology, architecture and other (Resmini, A. et al., 2011). A good information architecture would need to consider the users of a system or information environment, which suggests that the field is intended to provide a good user experience. Information architecture deals with the access and use of the immense amounts of information today (Resmini, A. & Rosati L., 2011). It could be understood differently in different contexts. IA could refer to the design of structure in an information environment; a combination of four systems (organization, labelling, search and navigation) for the development or formation of digital systems; or development of systems providing findability and usability (Rosenfeld, L. et al., 2015).

When it comes to *persuasive design*, the term *persuasion* has been forged out of *rhetoric*, going all the way back to Aristotle. Rhetoricians' main concern was to influence public speeches, which persuade their listeners (Fogg, B. J., 2003). Aristotle came up with modes of persuasion, also referred as rhetorical appeals, which include: *logos* (appeal to rationality, logic), *ethos* (appeal to establish plausibility, trust), and *pathos* (appeal to emotions) (Hasle., P. F. V. & Kjær Christensen, A-K., 2007). *Kairos* is the fourth mode of persuasion, and it dates back more than 2000 years. The word *Kairos* originated from ancient Greece and the youngest child of Zeus who was named Kairos meaning *"Opportunity"* (Sipiora, P., &

Baumlin, J. S., 2002). In addition, kairos was often translated to "timing" or the "right time", thus how the concept arouse as essential to classical rhetoric (Sipiora, P. et al., 2002). Fogg, B. J. (2003, p.41) outlined *Kairos* as *"finding the opportune moment to present your message"*.

Taking a more recent perspective on the concept of *persuasion*, Fogg, B. J. (2003) defined persuasion as "*changing attitudes or behaviors or both"*, while also stressing that there is a difference between persuasion and coercion or persuasion and deception. *Persuasion* would stand for voluntary change in behavior or attitude. In addition, in order to effectively persuade, different goals might require different persuasive strategies (Oinas-Kukkonen, H. et al., 2009).

Persuasive design has a strong relationship with technology. According to Fogg, B. J. (2003) technologies and persuasion overlap, which is how he came up with the term "captology" standing for *"computers as persuasive technologies"*. Captology would portray *"...design, research, and analysis of interactive computing products created for the purpose of changing people's attitudes or behaviors"* - Fogg, B. J. (2003, p. 5), where technology would play a central role in persuasion. In addition, since computers do not have intentions of their own, the persuader behind the technology has advantages over human persuaders. This is due to technologies being more persistent than people; allowing for anonymity; working with a lot of data; offering many ways of presenting information; growing rapidly on demand; and providing access from almost anywhere (Fogg, B. J., 2003). Finally, Fogg based one of his persuasive principles (suggestion) on kairos, where an interactive technology would provide the chance to suggest a behavior at the most opportune moment. Timing has been considered an extremely valuable concept for the effectiveness of suggestion in technologies. However, in order to identify Kairos, a research would require identification of when the timing is right (Fogg, B. J., 2003).

A visible connection is that both information architecture and persuasive design have strong relationship with technology and users, which indicates that the two fields could work together in the process of designing systems.

2.1.2 Scope and criteria

The literature search was performed in Scopus database and provided an overall of 26 results from combining the keywords "persuasive design" and "information architecture". The search was intended for discovery of studies, combining both information architecture and persuasive design fields and to find how and if the fields relate, and whether the fields could supplement one another.

Four (4) of the 26 results were associated with the search, while the rest of the papers have not been included in this review, as they did not match the search criteria and have been either addressing only one of the two fields or were found irrelevant to the topic of interest. One additional paper, which I previously had knowledge of, has been included in this review. The following subsection will display how the combination of both fields have been interpreted by research experts.

2.1.3 Findings

When looking at the reviewed papers, information architecture has been employed as a way of organizing and structuring of content within systems or processes, and at the same time, playing an essential role in the development of navigation paths within these systems (Bolchini, Garzotto & Paolini, 2008; Sah & Emmler, 2009). These characteristics are what would frequently be used to visualize the IA field.

When it comes to persuasive design, its contribution in the different papers varies, but mainly revolves around principles of persuasion. One of the papers benefited from using persuasive design by applying the persuasive principle *tailoring* for delivering personalized content, establishing relationship between message receiver and message sender (Bolchini, D., Garzotto, F. & Paolini, P., 2008). In a likely manner, another research noted that the principle *tunneling* (guiding the users through the system) may increase the knowledge they gain, and deliver appropriate information accordingly, as opposed to *user control*, where users take complete control over the system (Pugatch, J., Grenen, E., Surla, S., Schwarz, M. & Cole-Lewis, H., 2018). Moreover, in a third case, the field contributes with the principles of persuasion- *tunneling*, *tailoring* and *suggestion*, to assist users in achieving their goals in a system (Sah, P. & Emmler, O., 2009).

It appears that when persuasion is used in the context of combination with the IA field, most frequently principles of persuasion are used somewhere during or after the process of building a system, to influence or change attitudes or behaviors of people. Furthermore, a common topic in the contributions of PD in the papers seems to be the relationship between a system and users and the ease of use of a system or a process (Bolchini et al., 2008; Sah et al., 2009; Lykke, 2009; Pugatch, J. et al., 2018).

However, while using both IA and PD fields in one process, 3 of the reviewed papers lacked elaboration on how and where the two fields establish contact, which indicates that there is a need for a more in-depth exploration of the connection between the two knowledge fields. Only small amount of research had addressed the combination of the two fields more in-depth.

In his paper, Hasle, P. (2011) writes about the ideas and goals of persuasive design, where he declares that the field has wider implications with information systems design and that *"…persuasion is imbued with information and conversely"*. This statement came from claims that there are persuasive implications within information architecture systems such as labelling and organization, which could influence how users perceive the information within a site. According to him, persuasive design is the starting point of systems design, in contrast to it being a tool, which is applied somewhere in the process. He also specifies that most websites have persuasion aspects, even if they have not been planned or discussed (Hasle, P., 2011). Thus persuasive design and information architecture could together be part of one process.

Another research paper has also discussed the two fields in-depth, focusing on information retrieval and search systems (Lykke, M., 2009). The two fields have been used in combination, where here, as opposed to the previous paragraph, persuasive design has been employed as a support tool to the information architecture of the system. Their combination effectively simplifies the interaction between the user and

the system. This has been achieved by firstly, the use of the four IA components (organization, labelling, navigation and search systems) for analysis of the organization of information and construction of the system. And secondly, through implementation of PD principles, which make an improvement in the ability of the users to interact with the IA. A valuable outcome of the paper claims that the principles *tailoring*, *reduction* and *tunneling* may tremendously improve the interaction between the user and the system, while the principles *suggestion*, *surveillance* and *monitoring* could inform and encourage users to make use of the system features. One of the future considerations suggested in the paper is identification and examination of Kairos, the opportune moment, to *"present suggestions, guides, or reduce complexity"* in a system - Lykke, M. (2009).

2.1.4 Discussion

After examination of the various papers which use the two knowledge fields, it was revealed that in most of the cases IA has been used for structuring and organization of a system. While PD has been used for the implementation of persuasive principles for persuading users and/or making the interaction process between the system and the user easier. What most of the researches are not addressing, however, is the way the fields connect and where one falls short and the other comes strong.

My understanding of IA as a field has been built on Rosenfeld's perspective where IA would allow the structural design of an information environment, by breaking down the architecture into four components: *organization*, *labelling*, *navigation* and *search* systems (Rosenfeld, L. et al., 2015). *Organization systems* represent the way information has been structured and grouped together within an information environment (e.g. a website). The type of structure could be defined based on the type of content, in order to make the organization more logical for the user. *Labelling systems* are the component, which describes large information chunks or groups, or help the user to recognize what information they look at. Examples of labelling could be headings and titles, but also icons. *Navigation systems* serve as a compass, guiding the user through the website hierarchy structure. There are three navigation systems called *global*, *local* and *contextual navigation*, which allow the user to realize their location and travel back and forth into the hierarchy of the system (Rosenfeld, L. et al., 2015). *Search systems* allow the users to quickly discover the information they look for, or provide means for users to further explore relevant content on the platform, while they could be found as search boxes on websites. These systems are the components constructing the information environment, and providing usability, findability and comprehension for its users (Rosenfeld, L. et al., 2015). They will be described in greater detail in section *2.3. Information Architecture Components*. The components is also what I would consider as the strong side of the field. Of course users and their needs are also at the core of the field, and there are also many methods for exploring what the users want. However, one of the things I would consider as weakness, is that information architecture might not always be enough to successfully reach to the users.

And this is where I believe persuasive design could step in. As stated throughout this report, PD aims at changing behavior and attitudes of people (Fogg, B. J., 2003). My understanding is also that through persuasion, users could voluntary engage, re-engage and/or be motivated to perform a targeted designer intent, while this intent would aim to be beneficial for them. This is also where understanding the user behaviors and user interests in selected contexts are the core of the persuasive design field, since these factors are what has to be known in order to select persuasive strategy for execution.

As it has been seen before in several of the reviewed papers, persuasive design might be applied in the process of building the information architecture of a system to simplify interaction between the system and users, as well as increase persuasion. I would be more inclined to support that idea, rather than Hasle's statement of considering both fields as part of one process.

To address Hasle's statement that PD and IA are part of the same process, my belief is that it actually could, however not to a full extent. If designers of the system are the real persuaders in the process of persuasion, their persuasive intent could be a starting point in the process. That is if their intent is grounded in willingly motivating users of a system to perform a target behavior and having that intention throughout the design process. However, the designer's intention might not necessarily be connected with the users of the system, which would not be considered as "persuasive", since users are the ones who reflect whether or not a system is persuasive. E.g. a designer, whose intention is to simply create a system is not an actual element of persuasion, it would be an outcome. Fogg, B. J. (2003) discussed that *"Persuasion is based on intentions, not outcomes"* while describing intentionality as "planned effects". That suggests that until the designer's intent has the purpose to persuade someone to perform an action or change their behavior, then persuasion would not be part of the process of creating the system. In addition, to successfully apply persuasion would require more than the persuasive intent, where as Oinas-Kukkonen, H. & Harjumaa, M. (2009) stated "*persuasion-in-full occurs only when attitude change takes place*".

2.1.5 Conclusion

All things considered, my belief is that combining the two fields could highly improve a design process and make a system more efficient and successful in reaching its target users. The reviewed literature suggests that there are advantages to using the two fields. It has been established that information architecture could be used as the basis- the instrument through which an information environment is built. While persuasive design could serve as the tool for increasing the connection of the system with the targeted user. Used together, they could successfully address the places where one field comes short, in order to provide an effective system, which would improve interactivity for its users, and effectively persuade.

Under those circumstances, in order to understand how the two fields combined could reinforce one another, it appeared necessary to explore their application in a practical design process. The rather small number of articles and papers highlighted that not much research has been done in exploring the combination of the two fields in such process. My goal would be to visualize how the fields could work together, while in the processes of developing a strategy and designing a mobile system for the persuasive design conference in 2020. Furthermore, I would be exploring the presence of Kairos throughout the year of the conference organization process and the event itself, in order to reduce complexity and further increase motivation.

2.2 Theoretical Framework

This section identifies the nature of the research, which is the main guide of how data will be collected, analyzed and interpreted. It defines the meaning behind paradigms (philosophical worldviews) and research approaches, as well as specify their characteristics and applications in the research. The need for this section characterizes in the selection of a successfully tested model which would lead the research.

Theoretical framework symbolizes the way researchers investigate knowledge and the way that it could be interpreted (Mackenzie, N. & Knipe, S., 2006). Often times theoretical framework represents the paradigm, which a study is based upon. The paradigm portrays *"the intent, motivation and expectations for the research"* - Mackenzie, N. & Knipe, S. (2006), while also representing the beliefs, which influence the way a research should be carried out (Bryman, A., 2012). Hence, a paradigm is where the theoretical perspective of the study is placed. In many cases paradigms could be referred to as philosophical worldview, research methodologies, or epistemologies and ontologies, all of which lead quantitative, qualitative or mixed-method approaches (Creswell, J. W., 2014).

What characterizes the *quantitative* research approach is that it primarily relies on close-ended data or responses, such as numerical data and statistics, which might be used to prove outcomes (Creswell, J. W., 2014). Quantitative research is characterized as deductive, where the emphasis falls on testing of theories (Bryman, A., 2012). On the other hand, *qualitative* data collection primarily relies on open-ended data and apply open methods such as interviews and observations (Creswell, J. W., 2014). Furthermore, *qualitative* research distinguishes itself by being inductive, where the primary aim is the generation of theories (Bryman, A., 2012). However, there exists a possibility to use both research types. *Mixed methods* combine both qualitative and quantitative research and data, where the research outcome is represented by both numerical and textual information (Mackenzie et al., 2006; Creswell, 2014).

There are different research paradigms and their choice depends to a large extent on the purpose of the research. Some of the more common ones consist of *postpositivist/positivist*, *interpretivist/constructivist*, *transformative* and *pragmatic* paradigms (Creswell, 2014; Mackenzie et al., 2006).

It has been stated that the studies taking the *postpositivist* paradigm predominantly benefit from the use of *quantitative* approaches for data collection and analysis (Mackenzie, N., et al., 2006), since it most frequently aims at supporting a theory or reporting an experience. Researchers using the *interpretivist/ constructivist* paradigm mostly consider *qualitative* data as their main source of comprehension, as often they aim to understand the lived experiences of people. And lastly researchers employing the *transformative paradigm* (related to politics or change) or *pragmatic* paradigm (problem-centered) include *mixed methods*, both qualitative and quantitative research. This is where the most suitable type of method could be selected for a given study. (Mackenzie, N., et al., 2006)

This study had its focus on **pragmatic** paradigm, and made use of mixed methods for collection, analysis and interpretation of data. One of the main characteristics of having a pragmatic worldview is that the research problem is placed as central, where qualitative or quantitative methods are used together (Creswell, J. W., 2014). Therefore, the reason for selecting this paradigm was to employ mixed methods

and provide the research with a more exhaustive understanding about the problem. Another trait of this specific paradigm is that depending on the intended outcome, the main focus falls upon the "what" and "how" of the problem. Lastly, using both mixed methods for research compensates limitations found in each of the two types of data (Creswell, J. W., 2014).

2.3 Process Overview

After the selection of a model for researching and interpretation of data, the project required an outline of the big picture, which visualized the overall process needed to reach the goal of building a platform. Planning an information environment is a complex, but essential task, which demands for a phased approach, which can steer the direction of the project (Rosenfeld, L. et al., 2015).

This project followed *the process of information architecture development*, which has been developed by Rosenfeld, L. et al. (2015) in the book *"Information architecture: For the web and beyond"*. The selection of this process was based on its effectiveness in providing a broad view of the bigger picture organized as phases (Figure 1), where progress could easily be reflected as there is a clear understanding of the whole agenda in advance.
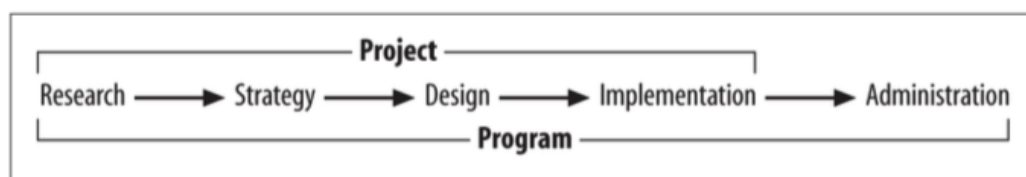

Figure 1. The information architecture process.

The process characterizes in having 5 phases: *research*, *strategy*, *design*, *implementation* and *administration*. However, this project operated within the first **three** phases, since the main goal was visualizing the connection between information architecture and persuasive design, rather than developing a highly functional tested prototype of the application. The last two phases (implementation and administration) represent the stage where the design has been put to the test before launching the system, as well as the next phase after the launch where the system would continuously monitor usage and user feedback in order to improve.

Research
In this project research characterized in understanding of the current information environment and the available content on the existing platform. In addition, this stage explored the goals and benefits of the conference, coupled with the different perspectives of the members of the community. Last but not least, the research also explored the intended audiences and what made the event interesting. The phase was assisted by the *information ecology* approach to research capturing the content, context and users of the information environment, which was described in more detail in section 2.2.1 Information Ecology. The research phase constantly tested a hypothesis of how the information environment could be structured, against the data obtained throughout the implementation of the various mixed methods. (Rosenfeld, L. et al., 2015)

Strategy

The second phase takes into consideration all of the outcomes of the research and analysis and provides a strategic plan for design implementation (Rosenfeld, L. et al., 2015). The phase included the organization process of content, in order to illustrate a structure for the new platform. This involved the development of a top-down information architecture look of the organization of content, which served as a guide for the design phase. Lastly, the stage delivered design requirements, based on all the research outcomes, which set ground for the design process.

Design

The third phase reflects the connection between process and actual deliverables. The design is what translates the strategy into a visual outcome of the information architecture of the system through the application of various design methods (Rosenfeld, L. et al., 2015). This stage went through the development of low-to-high fidelity designs of the system , which meant that the process went from idea-generation on paper, towards a more realistic look of the progressive web app.

In addition to the information architecture process, the project benefited from *requirements engineering*. As part of software engineering, *requirements engineering* (RE) addresses real-world objectives, functionalities and limitations of systems (Nuseibeh, B. & Easterbrook, S., 2000). Furthermore, in this project, RE played a major role in the process of discovering the purpose of the system and guided the way towards identification of users and their interests in that system. Finally, RE contributed to strategy generation and the formation of design requirements, which were later delivered during the design stage of the system.

2.3.1 Information Ecology

As it was mentioned in the process description above, the first phase (Research) benefited from the use of the *information ecology* approach. *Information ecology* is a more in depth look within the research phase, which explores a lot of questions related to the *context*, *content* and *users* of the study *(Figure 2)* (Rosenfeld, L. et al., 2015). Its importance is characterized in exploring all of the available aspects for the study, which allowed the generation of more thorough insights, and thus created a balanced approach to research (Rosenfeld, L. et al., 2015). This approach will be applied in *Chapter 4. Analysis and Data collection*.
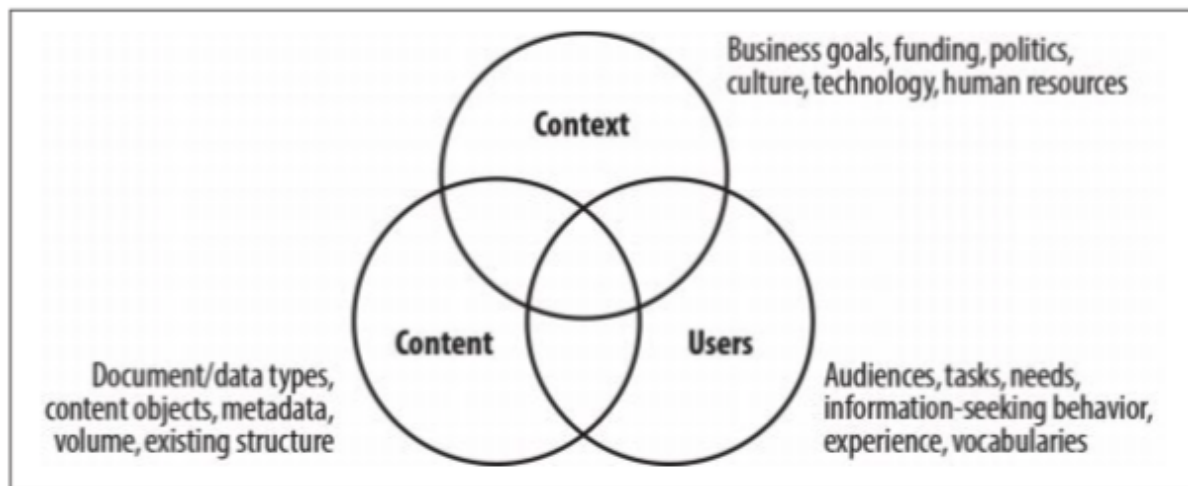
Figure 2. Information Ecology.
A balanced approach to Research.

Usually the **Context** represents understanding of the mission and vision of a business or environment, by exploring background information and different perspectives of people. In this study, the context looked at the meaning behind the conferences of Persuasive Technologies community, as well as its background history exploring how the whole concept started. Moreover, the context aimed at understanding the goals of the community, their target audiences, their organization process, as well as the way the conferences have functioned in the past. Some of the first steps for identification of the context included the reviewing of existing *background materials* (such as online and offline sources), and *research meetings* with the client, where the research got detailed information about the problem, planned content, needs, goals and audience of the system (Rosenfeld, L. et al., 2015). Finally, understanding the context remained a big part of what the strategy and design implementation phases were based on.

Rosenfeld, L. et al. (2015) defined **Content** as *"the stuff in your information environment"*, where content can be found documents, images, audio, data, web pages and more. Content requires exploration since in order to build, or in this case organize content, it needs to be analyzed and understood by the information architect. Furthermore, in order for users to use that content they need to be able to find it (Rosenfeld, L. et al., 2015). The research involved bottom-up exploration of the content within the information environment, as well as a top-down view of what the current structure of the conference websites looked like. Some of the efficient techniques employed for this stage of research include: *heuristic evaluation* of the current information environment, *content analysis* from top-down and bottom-up perspectives, *content mapping* of the current structure, and *benchmarking* (Rosenfeld, L. et al., 2015). Some of the findings from the context research were also related and included in the content stage.

Users are the ones deciding whether an information environment has been designed successfully or not. Sometimes, depending on the context, users are referred to as attendees, visitors, customers, employees and more (Rosenfeld, L. et al., 2015). As part of the research process, this stage was central in understanding who the users were and how they were using the information environment. Furthermore, the research explored the information needs, interests and motivations of the users, as well as their activities in order to identify their behaviors. Of course the selection of what to study in users was also based on the context. Exploring these aspects typically requires both qualitative and quantitative

research methods, some of which included *surveys*, *interviews*, and *workshops* regarding understanding user information needs such as the method *card-sorting*.

Analyzing the *context*, *content* and *users* of the information environment provided the research with a larger amount of relevant information, which was used for the development of a solid strategy based on all the outcomes. Rosenfeld, L. et al. (2015) said *"Good research means asking the right questions, and choosing the right questions requires a conceptual framework of the broader environment"*. Information ecology was what provided a basis of the research, and what connected it with the strategy and design phases.

2.4 Information Architecture Components

This section describes more in-depth the four information architecture components, which were briefly mentioned in *The Cross-field* discussion (2.1.4). These components (also called systems) are the basis of digital information environments, which create better structure and comprehension of the content. They also allow the easier discovery of information through the creation of navigation paths, helping users find their way in the system, and reach their desired place or objective (Rosenfeld, L. et al., 2015). In this project the components are also describing the design process of the Progressive Web App.

2.4.1 Organization Systems

Organization systems deal with the organization of information in a way that makes sense for people, so that it could be located. Language is ambiguous and different words could be understood in different ways, which is why there are various ways of organizing information to ease the search process for the user (Rosenfeld, L. et al., 2015). The types of content could be *heterogeneous* (objects which are not related to each other), or *homogenous* (related identical elements) (Rosenfeld, L. et al., 2015). The view of how content should be organized differs depending on the one who organizes the information environment. For this reason the information architect has to create an architecture that makes sense to the users of that environment.

Organization systems are build by *organization schemes* and *organization structures*. The organization schemes determine the typical characteristics of content and looks at how they could be grouped logically (Rosenfeld, L. et al., 2015). The organization structure of a digital system is mainly associated with the way users would navigate through the content and how it is linked.

On one hand *organization schemes* characterize either as *exact* or *ambiguous*. The *exact schemes* are distinctive with the information being mutually exclusive, which could be represented by alphabetical, chronological and geographical order of content (Rosenfeld, L. et al., 2015). And *ambiguous schemes* distinguish by organizing information by topic, task-oriented, with audience-specific categories etc (Rosenfeld, L. et al., 2015).

On the other hand *organization structures* visualize the *hierarchy* structure of the information environment, where a top-down approach is applied for visualizing how variety of content is connected

(Rosenfeld, L. et al., 2015). In contrast, the bottom-up approach relates to the *database model*, where content and its relation can be represented in great detail in databases. Finally, the organization structures in digital information environments can link content and chunks of information together, through the use of *hypertext*, which is typically used as a supplemental structure based on hierarchy and database model (Rosenfeld, L. et al., 2015).

The way organization systems have contributed to this project was by identifying the current information environment as *homogenous*, where the content was built around information related to the conference event. Furthermore, the *organization scheme* distinguished as *ambiguous*, where content was organized by *topic*. Finally, the project used organization systems to take a *top-down* look of the *organization structure* to visualize the way content was grouped together.

2.4.2 Labelling Systems

Labelling systems represent the component used to describe the content of the information environment. Labels are needed so people can recognize the information, which is being presented to them. The goal of labelling is to display information efficiently, while not requiring too much effort for the users to recognize it (Rosenfeld, L. et al., 2015). The labelling, however, should also consider the user's language in order for them to successfully read and understand the information environment. For instance, when users visit a website or application, the labelling of the global navigation menu should be clear enough for them to anticipate what information could be found when selecting a certain area to explore.

There are two label types- *textual* and *iconic*. The *textual* labels could be found in headings, contextual links (hyperlinks), options of navigation systems, keywords, and more (Rosenfeld, L. et al., 2015). Moreover, these labels could be describing chunks of information, hierarchical relationships, type of content etc. On the other hand, *iconic* labelling utilizes icons to describe these aspects without the need for textual description. They are especially useful when lacking space such as on mobile devices, or when there is too much information to look at.

Labelling and language are ambiguous, just as the organization of content could be, which again leads towards the topic about the users. The information has to be built based on their understanding of what the right language for describing information is. In order to ensure more representative labels, the information environment requires narrowing down the scope and context, as well as development of consistency in the way content is described (Rosenfeld, L. et al., 2015). One particularly useful method for studying users' perspective on labelling is card-sorting.

The contribution, which the project got out of labelling was characterized by both textual and iconic labelling for representation of content. Using consistent textual and iconic labels allowed for more minimalistic design for the new system, which increased its ease of use. In addition, the textual labelling has been supported by methods, which have considered the user understanding of how content could be labeled.

2.4.3 Navigation Systems

Navigation systems are what guides the user through the digital information environment. This component designs navigational paths, which lead the users through all the levels of the content hierarchy. As mentioned in section 2.1.4, the common embedded navigation systems consist of three types: *global*, *local* and *contextual* navigation, which function differently on different screen sizes (Rosenfeld, L. et al., 2015). Furthermore, they help users see where they are located in the system. The navigation systems also include supplemental navigations such as sitemaps, indexes and guides.

Global navigation system is present on all the pages of the digital information environment and are typically located on the top of the pages (Rosenfeld, L. et al., 2015). Since global navigation is the main point of navigation through the hierarchy, for the sake of good user experience, the location of their placement should be based on the user needs.

Local navigation systems are a complementary navigation found locally on the interface, allowing users to investigate the section they currently see (Rosenfeld, L. et al., 2015). Unlike the global navigation, local navigation is not constantly available on the interface, and would typically be available when there are more options or information to explore.

Contextual navigation is typically found within the context of the topic, where it can support associative learning. Hyperlinks are also type of contextual navigation, providing a quick way for users to navigate through the hierarchy, but they could also be used to tunnel users through a process. (Rosenfeld, L. et al., 2015)

The way navigation systems have been used in this project is by applying global, local, as well as contextual navigation on the mobile platform, to maximize the usability of the progressive web app and allow the easy discovery of relevant information for the users. Building the navigation of the system has been based on choices, supported by methods evaluating the existing information environments, as well as user needs.

2.4.4 Search Systems

Search systems represent information retrieval functionality, which allows the user to find information based on the indexed terms (Rosenfeld, L. et al., 2015). When there is too much information to browse in a system, search allows the user to discover relevant information in a quick manner. Search can be most useful when the users know exactly what they are looking for, however even then, there exist some challenges. One of the challenges in search systems is the ambiguity of language since people use different terms to describe the same things, which means that search is an iterative process depending on the search results (Rosenfeld, L. et al., 2015).

Indexing in search could be based on the selected organization scheme, however it could often aid in determining search zones as well. Where for instance, if content of the information environment has been organized by topic, the search could retrieve information organized by topic. The information is found by the search engine by retrieval algorithms, which determine what to retrieve by comparing the user's query with an index, searching for the same text (Rosenfeld, L. et al., 2015). There are different

ways to rank the retrieved items, some of which can be alphabetically, by relevance, by popularity or ratings. Finally, it can offer interactive patterns showing possible matches for the search while users are typing (autocomplete and autosuggest), which can help the search process.

Because the amount of content in the digital information environment is not much and complexity is low, this project did not include search systems. However, in the case that more content is added to the system, search would be a useful functionality for discovering information.

This section described the four components of information architecture, while pointing out how three of them have been implemented in the new information environment. The choices for building the information architecture components in the new system have been based on methods evaluating the existing information environments (heuristic evaluation and before-and-after benchmarking), as well as methods exploring the user needs and perspectives (survey, card-sorting and semi-structured interviews). These methods will be discussed in the following chapter.

3. Methods

This chapter outlines the methods, which have been employed throughout the project. The focus falls upon clarifying what the meaning behind each of the methods is, how they can be applied in the process, why they have been selected, as well as how they have contributed to the overall outcome of this project.

3.1 Heuristic Evaluation

The method *heuristic evaluation* represents a form of usability inspection technique, which evaluates a system, product or user interface (UI) based on heuristic principles of usability, in connection with its user experience (UX) (Nielsen & Mack, 1994; Wilson, 2014). The heuristic evaluation is considered a well established method in the user-centered design and is typically performed by a set of evaluators who individually evaluate a system and then discuss the outcomes.

Wilson, C. (2014) pointed out that the method consists of diverse categories: *object-based*, *task-based* and an *object-task hybrid*. In the *object-based* approach the evaluator inspects usability problems of a user interface (UI), which are related to the heuristic principles. In *task-based* approach the evaluator inspects the UI with the heuristic principles, while performing predetermined tasks, during which they note down which step of the task causes a problem. The *object-task hybrid* approach is a combination of the previous approaches, where the evaluator looks at the overall usability of the system and also follow certain tasks to analyze the UI more in-depth (Wilson, C., 2014). Furthermore, the method is relatively quick when used by experts, and can be employed when there is limited or no access to the actual users of the system. The main purpose of the method is to discover usability issues of a system's interface, by finding out missing heuristic principles. Addressing the missing heuristic principles of the system in a redesign process provides an improvement of the usability and enhances the user experience of the interface. The method could be used as a first step to improving the interaction between an existing system and the user.

Some of the strengths when employing heuristic evaluation is that it is ideal quick method when having limited or no access to users (Wilson, C., 2014). It serves in a manner similar to code inspections in softwares where it could effectively detect present errors. Furthermore, the method has no requirements for special resources, which makes it easy to employ in variety of products. On the other hand, the method has also weaknesses, where different evaluators could have a different idea of what constitutes a problem in the system. Moreover, the method does not provide solutions to problems and depends entirely on the experience of the evaluator (Wilson, C., 2014).

In this project, heuristic evaluation contributed to exploring the usability and functionality of the Persuasive Technologies conference websites on both computer and mobile platforms. Initially, the method has been applied to the past three website versions on computer platform, in order to explore more in-depth the structure and content of the system. In addition, the method provided understanding of the strong and the weak sides of the conference website. As a consequence, my knowledge in

information architecture and experience in the design field complemented the method and led to the development of ideas of how the missing heuristic principles could be implemented in the new system.

3.2 Benchmarking

Benchmarking represents an exploration method, concerned with comparison between different systems (such as competitors), or previous and current versions of the same system. In the first place, the benchmarking method is mainly employed for evaluation and comparison of systems. Rosenfeld, L. et al. (2015) claimed that *"We use the term benchmark informally to indicate a point of reference from which to make comparative measurements or judgments"*. That suggests that the method is a flexible tool, effective in measuring and comparing performance of other systems and recognizing opportunities for improvement.

There are two well known benchmarking types: *competitive benchmarking*, and *before-and-after benchmarking*. The first type, *competitive benchmarking*, looks at how competitors are implementing different aspects to their business or systems. These aspects can be various, depending on the main purpose of the method, where for instance it can look at how competitors are implementing information architecture features, or how they structure their website for a design process. On the other hand, *before-and-after benchmarking* is employed on a single system or information environment, in order to outline improvements over time. This approach also provides means to distinguish and prioritize the information architecture elements in the system (Rosenfeld, L. et al., 2015).

This project employed the *before-and-after benchmarking* approach, which has been used as a tool in cooperation with the heuristic evaluation method. The approach contributed with selecting and learning from the most effective structures, features and functionalities from the three previous website versions. In addition, the approach served as a productive tool for learning about the context of the conference, as well as types of information (content) which the new system should include. Last but not least, this approach allowed the careful consideration of working solutions for the new platform, while also taking into account the context and intent of the information environment, in order to ensure that suitable ideas have been obtained.

3.3 Mixed Survey

Surveys represent a research method commonly employed for the gathering of qualitative and/or quantitative user data in a relatively quick way. They can be used online through websites, however also by any form of connection with users such as in person, e-mail, mail or phone (Rosenfeld, L. et al., 2015). As a data collection research method, the survey allowed the gathering of insights from a pre-defined group of people.

The method has been particularly useful for data collection both quantitatively and qualitatively from the Persuasive Technology community. The survey was distributed to users digitally through e-mail. It was beneficial for getting a larger number of responses considering that the targeted audience are located in different countries, which would otherwise make it difficult to reach people individually. The method applied *close-ended questions*, which characterize in having predetermined available answers for

participants to choose from. The close-ended questions are typical for surveys, since often people would not spend much time completing them if they are not able to answer quickly.

However, the method also considerately incorporated *open-ended questions*, since they provide a richer data to the research by looking at the way users perceive a topic with their own words. In this case, the open-ended questions explored the way users saw the conference and themselves as members of the community through their own perspective. The open-ended questions characterize as a type of qualitative information, since they allow the participants to freely express their thoughts, in this case through a free write-in answers, rather than restricting their response through available answer selection. Therefore, the survey was considered as *mixed* type of survey, where both qualitative and quantitative data has been extracted.

The main purpose of administering the survey was to understand the information needs, opinions and values of the members who have previously attended the conference, and contribute to the construction of the overall context and strategy of the project. Through the use of close-ended questions, the survey formed an understanding of frequency of use of the system, as well as user preferences about notifications. Through the use of open-ended questions, the method contributed with extracting personal views about what makes the conference interesting and worth attending for people, as well as their main information needs required from the system. With this in mind, the survey also contributed with the overall knowledge about the *users* circle from the information ecology.

3.4 Card-Sorting

As further method for understanding the user, *card-sorting* allows the exploration of user information needs and perspectives on the system. Spencer, D. & Garrett, J. J. (2009) described the method as *"… a tool that helps us understand the people we are designing for"*. And since the users of the system are the ultimate judges of an information environment (Rosenfeld, L. et al., 2015), their perspective on what type of information belongs together is quite valuable. The method is mainly used for information architecture, where it contributes to organizing, grouping and labeling of information. Typically the method involves participants and a set of cards with content information written on them. Afterwards, participants are asked to sort and group those cards together according to their way of thinking (Spencer, D. et al., 2009). Consequently, the data is analyzed and the outcome is implemented in the redesigned or new system.

There are two approaches to card-sorting: *open* and closed *card sort (Spencer, D. & Garrett, J. J., 2009)*. *Open card sort* (Figure 3) allows the participants to produce and label groups of cards by their preference (Spencer, D. et al., 2009). This approach is more popular, as it provides a lot of knowledge about created groups and content of those groups, which might be different from the view of the designer. In contrast, *closed card sort* would present the participants with predefined categories (or groups), which participants have to fill up with the given cards. Open card sort has been employed in this project.
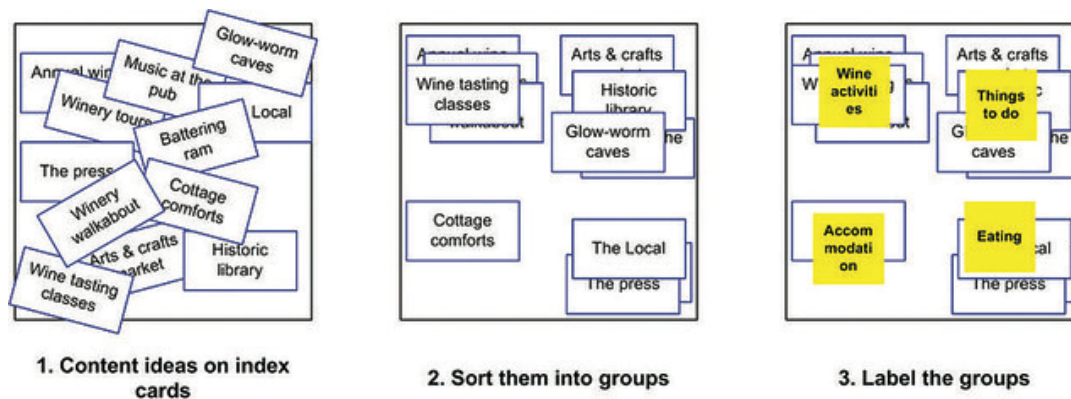
Figure 3. Open card-sorting process
Retrieved from (https://www.flickr.com/photos/rosenfeldmedia/3344343842)

Furthermore, the card sort could be performed on *group* of participants or on *individual* (team or individual card sort). The *team* card sorting allows for discussion between the participants and therefore generate ideas and provide more in-depth information, which might not otherwise be taken from individual card sorts (Spencer, D. et al., 2009). The discussion between participants could potentially bring insights such as what they like and dislike about the current website. A weakness of the team card-sorting to consider is that there might be a more dominant member of the group, who could affect the opinion of others, which is why all the participants must be encouraged to share their thoughts throughout the process. On the other hand the *individual* card sort is considered as easier to operate, and the one which could get more responses and results from individuals. However, the main disadvantage is that it would not allow for discussions and thus reduce the chance for discovering beneficial information. Moreover, the process is considered to be much more time-consuming, compared to the team card-sorting. (Spencer, D. et al., 2009)

Finally, the open card-sorting contributed with valuable insights about how the group of participants perceived information, and the way they understand the conference and its activities, together with some of their very first information needs from the website. This is also where the previous method (survey) was convenient, since it also identified certain aspects of how people used the website. In addition, the card-sorting discussion provided knowledge in some of the factors which could influence the participants' decision on attending the event. Lastly, the method provided additional content for consideration.

3.5 Semi-structured interviews

The last part of capturing the user perspective was employing *semi-structured interviews*. This method is considered qualitative since the researcher is in direct contact with the interviewed user. Therefore as a qualitative approach, it allows the research to obtain rich data about the topic of study seen through the eyes of the actual user. It aims to explore more in-depth the issues or processes of interest to the research, which can be a follow-up of other quantitative methods, since participants are asked to elaborate on their answers. What characterizes the semi-structured interviews is their way of having a goal to learn about an issue or process through preparation of a number of questions to follow. While at the same time, the semi-structure allows the opportunity to ask further questions regarding what might

be considered as significant replies by the users (Bryman, A., 2012). This is important, since having a structure to follow ensures that the interview will not miss on valuable information.

The typical process of conducting a semi-structured interview starts with planning the overall topic and goal of the questions for the interview. Followed by organizing meetings with the users, and ensuring that they know the purpose, intended use and conditions of the interview, which includes protecting their confidentiality and anonymity. Finally the interviews are carried out, where audio (or video) recording could be included, as they provide the opportunity to capture more data for analysis, rather than notes taking, which could restrict the possibility of asking relevant follow-up questions.

This type of interviews allow open-ended questions for richer insights, in contrast of close-ended, which would not allow the use of follow-up questions. Furthermore, the approach has a moderate structure to keep the interview process focused on the goal, rather than permitting the direction to go off topic. Finally, the semi-structured interviews are also cautiously designed to both acquire the needed information through having a structure, and at the same time allow users to express their opinions on the topic of interest.

The semi-structured interview contributed to the overall understanding of how the system (website) is used by the users. Together with learning about their main information needs from the system, the method also discovered several phases where different information would be required by users. Furthermore, the interviews extracted more in-depth insights into the participant's viewpoints on mobile usage and notifications, which was considered as supplementary data to the previous methods. Lastly, the semi-structured interviews provided additional perspectives, which enhanced the overall knowledge of the context, content and users.

3.6 Persuasive Systems Design (PSD) Model

To utilize the understanding of persuasion in theory I have employed the Persuasive Systems Design (PSD) model. It is predominantly used for the evaluation of a software system, through the implementation of persuasive principles (Oinas-Kukkonen, H. et al., 2009), however it can also be applied for designing persuasive systems.

The PSD model is based on principles originally defined by B. J. Fogg, however, the model applies principles directly to the development or evaluation of a persuasive system. When used as an evaluation method in systems, the PSD Model can predict how a system would influence the users, through analysis of the persuasive principles. According to Oinas-Kukkonen, H. et al. (2009) before design or evaluation of a system through the PSD model, the designer has to understand the issues behind persuasive systems, and analyse the persuasive context.

The model consists of 28 persuasive design principles, grouped into 4 categories- *primary task support*, *dialogue support*, *system credibility support* and *social support* (Oinas-Kukkonen, H. et al., 2009). The *primary task support* is from the most commonly applied categories, which aims at helping the user to achieve their goal when using the system. The *dialogue support* provides feedback for the users of the system, while at the same time supporting their goals and the behavior. The *system credibility support*

represents principles for making a system more credible and trustworthy for the users, thus making it more persuasive. And finally, the *social support* category is characterized in motivating users through social influence. (Oinas-Kukkonen, H. et al., 2009)

Finally, in this project the PSD model has been applied as a design method rather than evaluation, in order to support the persuasive layer of the new system, the progressive web app. The method provided means for users of the system to stay engaged throughout the course of a year, as well as increased the chance for users to perform the target behavior.

4. Analysis and data collection

This chapter describes the connection between research and strategy phases from the information architecture process. Moreover, *information ecology* described in section 2.2.1, serves as an effective approach to research for the interpretation of the context, content and users. In addition, the chapter captures the data, gathered during the research phase, to employ both quantitative and qualitative methods for its interpretation. The research findings lead towards the development of a strategy and formulation of design requirements serving as a transition towards the design phase.

4.1 Context Analysis

The context characterizes in the formation of a perspective on a topic, where everything learned provides meaning. For this reason it was crucial to understand the goals and environment in which the persuasive technologies community functions. Understanding the elements, which formulate the context is what would affect and shape the information architecture strategy (Rosenfeld, L. et al., 2015). This section explores the idea behind Persuasive Technologies community, what their goals are, their background history, as well as their intended audience and overall process before and during the conferences. This would be achieved through background research coupled with interviews with the case representative. In addition, the section would be supported by analyzing the persuasion context (Oinas-Kukkonen, et al., 2009), which clarifies who the persuader is, what is the intent and how the message will be transmitted to the target audience.

4.1.1 Background Research

"Community of practice are groups of people who share a concern or a passion for something they do and learn how to do it better as they interact regularly" - Wenger, E. (2011). The groups typically follow their interest in the specific domain and their relationship helps with learning, where interaction is essential. Some of the various activities include problem solving, seeking experience, discussing developments, mapping knowledge and identifying gaps (Wenger, E., 2011). The community of practice also innovate, solve issues, create new knowledge and contribute in their domain.

Persuasive Technologies represents a research community which explore design, development and evaluation of technologies through the lens of persuasion. They aim for attitude and behavior change, without coercion or deception. Each year the community organize conferences internationally, where researchers gather and present their papers and contributions to the field. The papers are anonymously reviewed and approved or disapproved beforehand. In addition, the research community aims at enriching people's lives through assisting them set and achieve their goals, and as a consequence - change their behavior (https://www.persuasive2019.org/call-for-papers/). Once per year the conference event is held in a different country, where the aim of the event is to appeal to *researchers and practitioners from industry and academia*, whose work is related with persuasive technologies topics (http://www.persuasive2018.org/call-for-proposal/). So far the conference has taken place in 13 different cities around the world.

4.1.2 Research meetings

Research meetings were the first step to gaining insights into the context about the mission, vision and everything else related to the research topic through the clients' interpretation. The following information has been obtained from research meetings with S. Gram-Hansen, who is a member of the Persuasive technologies community and an organizing chair for the next year's conference in Aalborg, Denmark. Several meetings were conducted as semi-structured interview, in order to better understand the overall context about the community and to gain an additional perspective.

The interview meetings established that the very first conference was held in Eindhoven, Netherlands in 2006, where the event had initially started as a small workshop. Every year the conference is held in different location and in order to have conference in a specific city, members would need to put together a bid. The bid represents a presentation of what could be offered by hosting the conference, as well as additional information about place, activities, budget, university and organizers. That information is later sent to the steering committee of persuasive technologies, where it is being discussed and if necessary a vote is initiated in order to choose where the next conference would take place. The bid is also considered as additional data to this research, since it provided insights into some of the information related to the conference in 2020. In addition to the organization host, part of the steering committee is also involved in the organization process of the conference to ensure that all requirements are met. The organization process also includes selection of reviewers for submitted papers and sending out the papers for review, all of which is anonymized. Accepted papers are being presented on the conference and published. In addition, the conference would also involve workshops (which could also be published) and tutorials, which allow for more social interactions between attendees. The event is mainly about networking and gaining new understanding of the field. Furthermore, the attendees include researchers and practitioners, as well as students whose work is related to the conference topic.

Finally, the interview meetings led to the understanding of a process throughout the course of a year, which starts from the end of the conference in 2019 and ends when the new conference takes place in 2020. This process includes the information the audiences look for, and the events occurring throughout the year until the actual event takes place. For instance, the initial process starts when the last conference in 2019 ends (April), where the audience look for *general information*, such as where and when the next conference would take place, as well as what the theme of the conference is. Consequently, after the summer period, there is a process of writing, submitting and reviewing of papers related to the topics of the conference. After the review and acceptance of papers (around December), the process shifts back towards looking at *general information* about the conference and *registering* for the event. Lastly, around February, people would start getting conference ready, where they explore more *detailed information* such as the city of the conference, places to visit and accommodation. This process included various information needs, while important to realize was that different information would be required (and considered more relevant) at a different point in time.

Having an idea of what sort of information is required at a given time during the year allowed for consideration of *Kairos*, the opportune moment, previously introduced in section *2.1.1*. Kairos in this case, could be used to persuade the target audience to attend the conference through the use of technology prompts, which would trigger the system user with the aim for effective persuasion. However, as stated by Oinas-Kukkonen, et al. (2009) *"Without carefully analyzing the persuasion context, it will be*

hard or even impossible to recognize inconsistencies in a user's thinking, discern opportune and/or inopportune moments for delivering messages, and effectively persuade". Before considering kairos, the persuasion context had to be analyzed.

4.1.3 Persuasion Context

The persuasion context identifies the persuader and their intention (the intent), while also considering the use, user and technology contexts (the event), and finally addressing the message and how it would be transmitted (the strategy) (Figure 4) (Oinas-Kukkonen, H. et al., 2009).
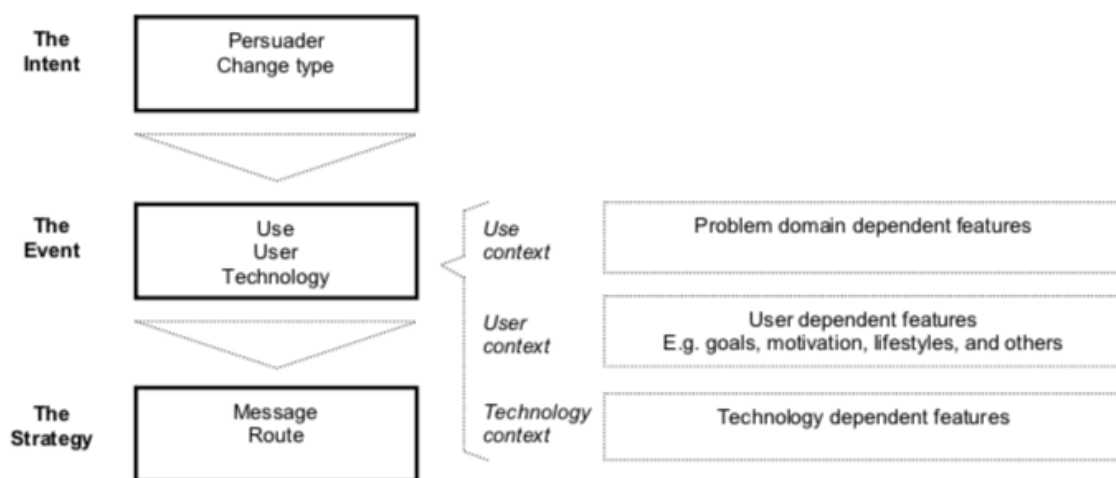

Figure 4. Analyzing the persuasion context.
(Oinas-Kukkonen, H. et al., 2009)

According to Oinas-Kukkonen, the persuasion context characterizes in the interpretation of the roles of the persuader, the ones being persuaded, the message, and the larger context.

The Intent
The first step was looking at *the intent*, where it has to be recognized that technologies do not have intentions of their own, and the ones who create, distribute or adopt those technologies are the ones with the intent (Oinas-Kukkonen, H. et al., 2009). Moreover, persuasion requires intentionality. According to Fogg, B.J. (1998), there are three types of intent: *endogenous* (people creating a technology), *exogenous* (those distributing the technology), and *autogenous* (when someone changes their own attitude or behavior). In this case, the designer of the technology (the progressive web app interface) characterized as the one with the intent to persuade. As a result, the intent distinguished as *endogenous*, since the technology was created or produced by someone. Furthermore, as the persuader, my intention was aimed at behavior change, which would induce an action with the user voluntariness towards that action. Finally, the interview meetings noted that not many people are attending the conferences, and since the community is rather small, a consequential intent was to encourage people outside of the community to attend the conference.

The Event

The second step involved *the event*, where particular attention was given to the *use*, *user* and *technology* contexts. The persuasion event looks at interpreting the user of the system, their situational factors and technology (Halttu, K. & Oduor, M. & Tikka, P. & Oinas-Kukkonen, H., 2015). Firstly, the domain specific issues within the **use context** needed to be addressed. Contextual factors include situational and/or other enduring effects, however, in this project, the use context was characterized by the task-related factors or the user tasks in the persuasive system (Halttu, K. et al., 2015). As noted from the interview meetings, the users typically obtain various information related to the event, during different time of the year. It was found that users- obtain general information about the conference event; they write, submit and review papers; they acquire further information about the event and also registration process; and finally, near the event, users obtain more detailed information about the location and activities. These factors were considered *task-related factors*, and were the first insight which was crucial to consider for the persuasion process and for the development of the new platform.

The **user context** is related to the factors describing the differences of the users, which are important to understand, as they influence the persuasion strategy. When it comes to the target audience, often the conferences include researchers and practitioners within the persuasive technology domain, including the steering committee, as well as researchers who visit once every second or third year. In addition there are also attendees, such as phd students, who visit one or two times to get the latest insights when their work is connected with the field. The interviews also noted that most of the time the conferences include approximately 100 people, some years even 200, however other times the numbers have been down to 50 and that might depend on the location. Nevertheless, even though there was knowledge of the variety of users attending the conference events, it appeared necessary to explore the user interests in the event and their information needs, which required involving them in the research process. Users information needs and behavior would be further addressed in section 4.3 *User Analysis*.

Finally, the **technology context** captures the device (or technology) factors, which also play important role in effective persuasion (Oinas-Kukkonen, H. et al., 2009). The Progressive Web Apps (PWAs) outlined in section 1.3 served as the technology for persuasion in this project. The reason why PWAs are much more efficient compared to normal responsive website on mobile, is that they allow for prompts. And prompts greatly increase the persuasive power for users to perform the intent. Moreover, this technology allows the consideration of Kairos, where the opportune moments contribute to the identification of when these prompts are relevant for the users. Without the use of Kairos supporting the user information needs, the prompts would be irrelevant and maybe even cause frustration in users.

The strategy

The persuasive strategy represents the *persuasive message*, which the persuader aims to convey to the users through the selected technology (Oinas-Kukkonen, H. et al., 2009). In this project, the message aimed to persuade the users that attending the event is beneficial, as they can obtain the newest knowledge in the field, and benefit from networking opportunities with variety of people attending the conference. The second step to persuasive strategy was consideration of the proper route to reach the user, between *direct* and *indirect* route. *Direct route* requires careful evaluation of the message by the users, where the message should be appealing to the user's reason and intelligence (Oinas-Kukkonen, H.

et al., 2009). While on the other hand, *indirect route* relies on less information where simple cues are used to persuade. In this case, *indirect route* was considered more relevant, as it refers to the cues, or relevant prompts and reminders, which can be used to persuade. Considering that the mobile phones are one of the greatest persuaders since they are constantly by our side (Fogg, B.J., 2007), the indirect route was more efficient. In addition, mobile users would not find large textual information appealing nor persuasive on the small screen. Moreover, taking into account that mobile users might be walking or located in an environment where they are not very attentive, they would more likely be persuaded by indirect cues.

The outcome of analyzing the context established a solid ground for understanding the process up until the actual conference event for the persuasive technologies community. As a result, the research meetings provided knowledge of the modules where different information would be required. The outcome of the interview meeting showed that one of the missions of the project is the structuring of the new information environment, with consideration of the user needs. Another aim was the further exploration of the user information needs, in order to understand when certain type of information is more relevant than other. Finally, the persuasion context considered the persuader, the ones being persuaded, as well as the persuasive message, which would be transmitted to them, serving as a guidance towards effective persuasion.

4.2 Content Analysis

This section identifies the content, also referred to as the "stuff" in the information environment (Rosenfeld, L. et al., 2015). A top-down approach was employed, in order to get an overview of the information hierarchy. The approach is balanced and supported by a bottom-up analysis, going through a process of studying the objects which shape that information. This has been achieved by exploring and learning from three versions of the information system, discovering missing information, and differentiating one object from another to gain an idea of all the pieces constructing that information environment.

4.2.1 Heuristic Evaluation

To narrow down the findings from the context analysis, an analysis of the website platforms from the previous 3 years has been performed. The method was employed for a wiser and quicker idea of how the information hierarchy of the new platform has been constructed. Rather than start everything connected with structuring of the website from scratch, *heuristic evaluation* provided means for learning from the existing information environment, discovering what is worth keeping, as well as problem areas in need of improvement.

As an expert method, which makes use of design guidelines to evaluate a platform (Rosenfeld, L. et al., 2015), heuristic evaluation is one of the first steps for looking at an information environment. Compared to individual expert review method, heuristic evaluation does not require in-depth understanding of the context, users, tasks and environment in order to be performed. In fact the method has been used before comprehensive review of background materials, in order to avoid bias and clearly perceive how well the platform is functioning against a set of principles. For this purpose, an *object-based* evaluation has been performed (Wilson, C.**,** 2014), where the scope was concentrated on the user interface such as information architecture elements (global, local and contextual navigation, labelling, organization), as well as additional elements such as controls, error messages, pages and other features.

Upon applying the method on the past three website versions, it was observed that the versions from the years of 2017 and 2018 had 2 missing heuristic principles each *(Appendix 1)*, some of which could be considered as major errors in the systems. Some of the major errors included missing indications of current location of the users, misplaced or invisible global navigation sections, as well as links leading to non-existent pages.

The latest website version of 2019, however, seemed to have considered and eliminated all of the past errors from previous versions. The design was focused on the destination, relying on plenty of spectacular views of summer scenery, and generally minimalistic design allowing for quickly recognized information throughout the pages. The interface also included plenty of quick links in the form of hyperlinks, aimed at the more expert users, which allows for better user experience. On the negative side, my initial observation as a non-member of the community was that there is no information inviting new people to join the conference. This statement also applies for the previous versions. In other words, informing new audiences would be a point, which has been overlooked in the above mentioned platforms. Furthermore, information about the community and their goals could be found in "Call for papers" in between textual descriptions, which was quite difficult to find unless having an exploratory approach to searching for information. Even if users came across the description of the community, it still appeared too concise and general.

On the other hand, as established during research meetings, one of the missions would be the planning and designing of a progressive web application, which would support mobile users. Thus the heuristic evaluation method was also applied on the mobile platform, where the picture appeared to be different. *Figure 5* represents a table, visualizing the heuristic principles for the mobile website platform.

Heuristic Principles	Mobile web
1. Visibility of system status	X
2. Match between system and the real world	
3. User control and freedom	X
4. Consistency and standards	
5. Error prevention	X
6. Recognition rather than recall	
7. Flexibility and efficiency of use	X
8. Aesthetic and minimalist design	
9. Help users recognize, diagnose, and recover from errors	
10. Help and documentation	X

Figure 5. Heuristic Evaluation of
Persuasive Technology 2019 mobile website

The heuristic principles which have been marked with a red cross represent the missing principles within the website. Both the missing and the present principles are discussed in the following paragraphs.

1. The heuristic principle *Visibility of system status* is aimed at keeping the users informed of where they are located, by providing them with relevant feedback within the system (Nielsen, J. & Mack, R. L., 1994). When interacting with the platform, it was difficult to navigate deeper in the hierarchical structure of the system through the global navigation menu. The only way to expand the menu and view the sub-menu options was achieved through the click of the "+" icon, which also lacked visibility (Appendix 2A). This could prevent users from reaching their target destination in the system. In contrast, a more intuitive interaction could be achieved by expanding the clickable field through the whole button including the labelling (textual description) of the global navigation.

2. *Match between system and the real world* could be characterized in speaking user familiar language, which they should be able to understand (Nielsen, J. et al., 1994). At the top hierarchy level the system has the principle included where even academia-related terms have been explained.

3. *User control and freedom* explored whether the system supported *"emergency exit"* where users could leave unwanted state in a quick manner (Nielsen, J. et al., 1994). Even if minor, an error was discovered upon opening image files from the system, where the *exit* icon was hidden behind the image frame (Appendix 2B). This could affect the interaction of more novice users of the platform.

4. *Consistency and standards* prevents confusion for users, and is achieved when the interaction and language patterns of the system are consistent. The website appeared to follow the

36

standards and had consistency in the labelling of content, as well as the navigation and design of the system.

5. One of the main factors for causing dissatisfaction in users is errors. *Error prevention* is the principle which considers errors and eliminate them to allow a good user experience (Nielsen, J. et al., 1994). However, there were two major errors present during interaction with the system, both of which were related to missing information on the mobile platform. Upon acquiring information about the program of the conference, on several places half of the information on screen was missing. In a similar manner only half of the content regarding registration fees was visible on mobile device (Appendix 3 A and B). For each of the two errors, zoom out or swipe interactions were also unavailable. These errors are major and should be considered and removed from the system.

6. *Recognition rather than recall* characterizes in making the information and functionalities of the system visible for users, while designing for recognition rather than making users remember items from the beginning (Budiu, R., 2014). Overall, it was noted that both the interface and content of the system were built to help users reach their desired outcome.

7. *Flexibility and efficiency of use* looks at whether the system has implemented accelerators for a quicker interaction through tailored actions (Nielsen, J. et al., 1994). This principle takes into consideration the expert users, who have more experience with the interaction of the system, as they are likely to use it in a different manner compared to novice users. On the mobile platform, the global navigation bar was only available at the top of the page and when users are located further down on longer pages, the menu was not available unless scrolling all the way back to the top. In order to avoid poor user experience caused by slow interaction with the system, this accelerator should be considered for implementation for both experienced and novice users. Lastly, the system lacked support of accelerators, which are well known by mobile users, such as swiping right for going one step back to the previous page.

8. The heuristic principle *Aesthetic and minimalist design* represents an interface with minimum load of design elements and cutting on unnecessary items to allow simplicity for the user, therefore making the design minimalistic. With the exception of one page "Call for papers" where the information looked disordered due to the volume of information, the platform generally allows for minimalistic design with simple, consistent pages. Nevertheless, the principle should be considered for the development of the new platform.

9. *Help users recognize, diagnose, and recover from errors* is a principle generating a visual feedback for users who have reached an error state in the system, guiding them towards a possible solution of the problem (Nielsen, J. et al., 1994). No user-caused errors were found on the current platform, however, a custom error message page would be advised rather than the server's built-in message (Nielsen, J., 2001).

10. *Help and documentation* is beneficial in a system to provide users with additional information, which is easy to follow. Frequently Asked Questions (FAQ) could be used to clarify information about the conference to newcomers, but also more specific information about submission, and other topics which people ask about frequently.

The method provided ground for understanding the content and structure of the conference website versions on both the computer and mobile platforms. While the last website version had considered past errors on computer platform, the mobile platform lacked a large number of heuristic principles, critical for good user experience. Furthermore, some of the missing principles were major errors, which prevented valuable information from reaching the user. The weakness of heuristic evaluation method is that there are no guidelines on how the discovered errors can be fixed, however, I have combined the method with my knowledge as an experienced designer to provide suitable solutions to resolving these errors.

A point often overlooked by designers are the heuristic principles found within the system, where only the missing ones would be addressed in the redesign process. Therefore, the design stage would also consider and implement the principles which were found present in the system, together with the missing ones, in order to deliver a good user experience.

4.2.2 Before-and-after benchmarking and content mapping

Together with the heuristic evaluation, *before-and-after benchmarking* was also performed on the past 3 websites to learn from the existing information environments. The method gave an overview of how information was structured and used, and how heuristic principles errors located in the previous year websites (2017 and 2018) have been considered for the development of the new website 2019. Before-and-after benchmarking was performed to learn from the existing information environments and better understand what kind of content shaped the platform. It was also employed to evaluate the improvements of the platform overtime and extract larger volume of information from past versions, which might not have been considered in later versions of the platform.

A top-down approach

The first step for understanding the content was to employ a *top-down* information architecture approach, where the structure of the information systems was analyzed. This was done to take a look "from above" (Rosenfeld, L. et al., 2015) and visualize the way the pages have been positioned.

What made an impression when looking at the three websites was observing a pattern in the way which information was presented, where the hierarchy of the platforms included very similar categorization of content **(Figure 2, below)**. Information about the event itself could be found, including dates, social events, hotels and venues. Big part of that information appeared as *homogenous*, meaning that it was mostly related to the conference event, however, not all the information was related. Distinct information about paper submission and deadlines occurring at different times for authors was also found. As a result, the digital environment was identified as *heterogeneous* (Rosenfeld, L. et al., 2015), where in addition to various categories, information was also found in external links leading to other platforms. *Figure 6* has been created to allow a top-down look, or in this case left-to-right overview of the structure of content for the three persuasive conference website versions.
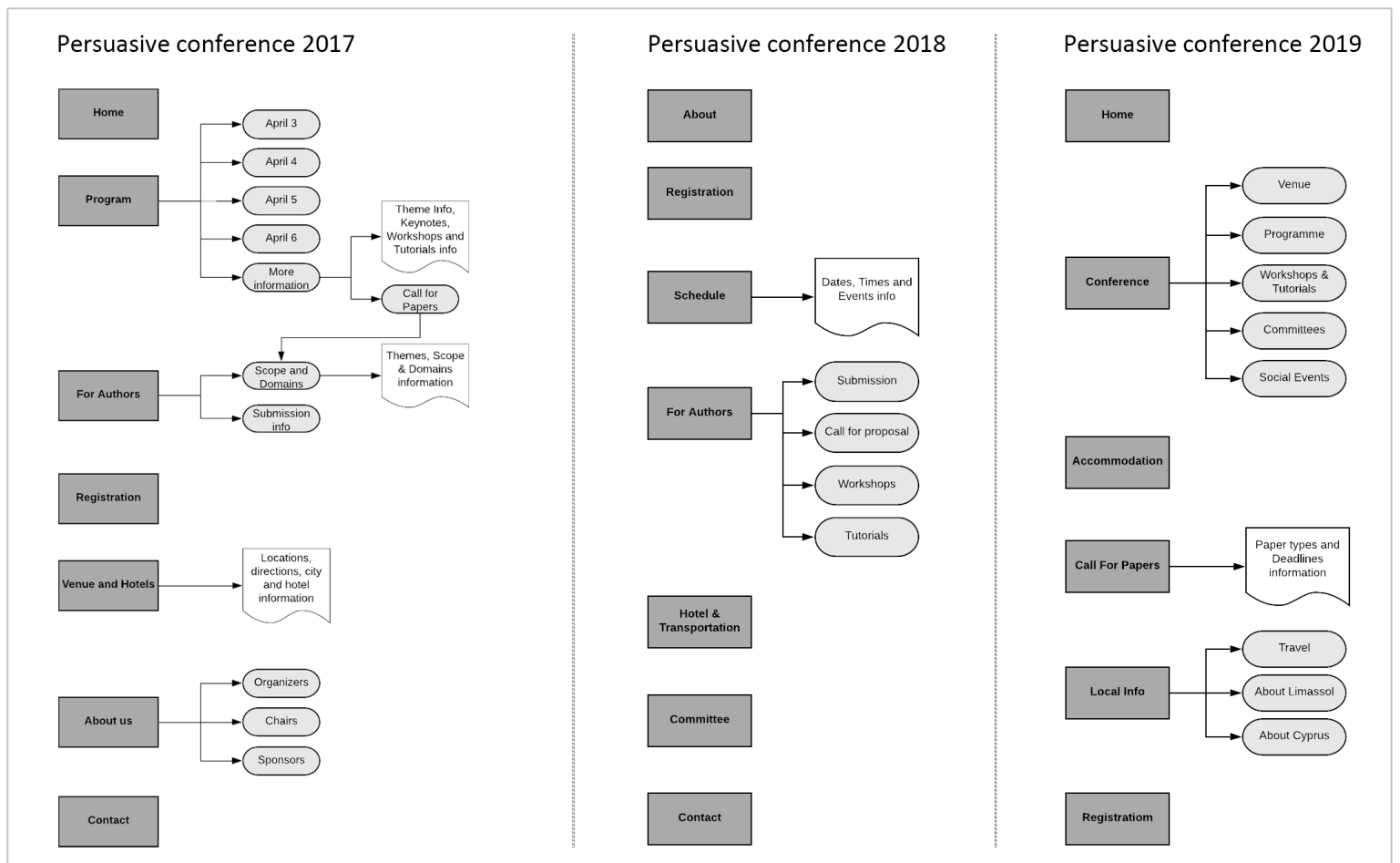
*Figure 6. Website hierarchies for
persuasive conference 2017, 2018 and 2019 websites.*

It can be seen that the 2017 version has more depth of content. As a result, information such as theme info, workshops and tutorials are hidden behind the label "More information", which might be challenging to find for some users. Having more depth in general makes the information search process more complicated. Conversely, the 2018 version appeared to have more width and little depth of information. As a consequence, when opening certain sections the users would have to scroll down a list of information to find what they are looking for, which could also complicate the process. The latest version (2019) has a balanced depth and breadth of content with local navigation bars allowing for easier interaction and discovery of information. The visual design of the websites has also been performed in an identical manner aiming for consistency and simplicity, while much of the textual information has been replicated throughout the years. Additionally, an observation was made where the 2019 and 2017 versions were missing general but valuable information. On the *workshops & tutorials* page, there was no clarification of the purposes of the conference workshops and tutorials, and why they should be visited. However, some of that information could be found on the *submission* information pages, as well as in the conference website version of 2018. It could potentially be an influencing factor for the decision of newcomers to attend the conference. Therefore it was necessary to consider including it in the new platform.
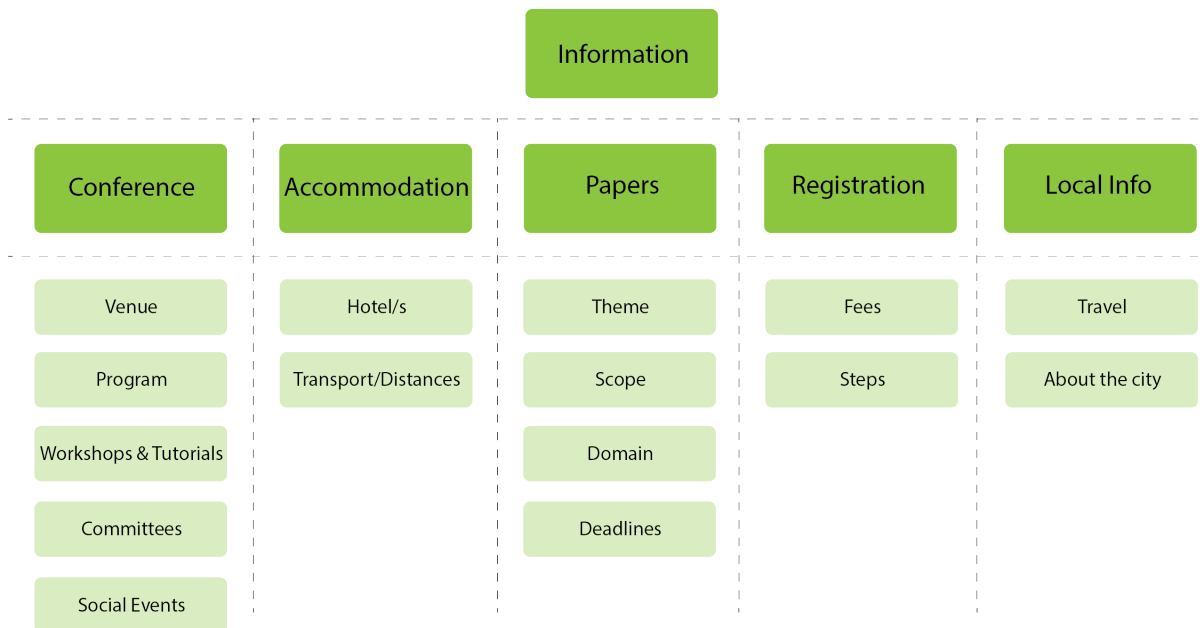
A bottom-up approach

The second step was to implement bottom-up information architecture approach to break down the general content into smaller pieces and provide means for it to be analyzed more in-depth.

A content inventory is ideal when in need of understanding the current content (Spencer, D. & Garrett, J. J., 2009). The method was performed on the last website version, where the inventory has been created in an Excel document, in order to to grasp all the pieces of information that go on each of the pages *(Appendix 4)*. Except for generating a comprehensive list of the pages of the website, the content inventory granted a full look of the different type of content and volume on the platform, allowing for easier observations and analysis of the data. The process involved creating a table with specifications of each of the levels throughout the website hierarchy (pages and sub-pages), as well as first level heading of the specific page with a hyperlink to the site. Furthermore, the document included a column specifying downloadable files on the platform and a comments section where observations for specific pages have been written down. Additionally, content inventory has been of tremendous help for picking out content for the method card-sorting, which will be discussed in *4.3.2 Card-sorting*.

The next part of the bottom-up approach was the identification of the organization scheme of the platform, how information has been grouped together and how it has been prioritized when it comes to main topics of the conference website.

The way a website is organized is determined by organization schemes, which could be *exact* (dividing information into mutually exclusive parts), or *ambiguous* (dividing information into categories) considered as useful for exploratory search of information (Rosenfeld, L. et al., 2015). The overall organization of the content on the conference website versions was characterized as *ambiguous*, since information has been grouped in a rational meaningful way. Furthermore, the content has been organized by *topic*, which also indicated ambiguous organization scheme.

The identified topics appeared to represent the information with highest priority throughout all the platforms. For example the detected main topics were information about *conference*, *accommodation*, *papers submission*, *registration* and *location*. Each of the main categories included sub-categories also commonly met in the previously analyzed platforms *(Figure 7)*.

Figure 7. Overview of the information.
General topics and sub-topics from the websites.

The above figure visualizes the bottom-up information architecture for the information found throughout the websites for the past 3 years. This approach represented the chunks of information which construct the digital environment. The analysis contributed with first, distinguishing the topical organization, and second, discovering the information which was practical for inclusion in the new digital environment (Rosenfeld, L. et al., 2015).

Outcome

The purpose of analyzing the content is to provide the data needed for creating a good user experience (Rosenfeld, L. et al., 2015). This section combined several methods and led to discovering the types of information and better understanding of the content, while also pointing out several findings.

First, the hierarchy of the three websites discovered gap in information on the latest website version, which will be considered during the development of the new platform. Second, content inventory provided a grasp of the individual information, while establishing observations on the separate pages of the latest platform. Third, the analysis went from top-down view of the information and deeper towards analyzing the bottom-up structure, and back to a top-down view, where the analyzed content provided a map summarizing all the main information. This included the topics found on the platforms, together with all the chunks of information provided by the websites.

Finally, before-and-after benchmarking was extremely useful for the understanding of context and content, however, to avoid risking borrowing bad ideas together with the good ones, actual users of the platform had to be involved in the process.

4.3 User Analysis

Involving the users provides the research with knowledge of their interests, needs and motivations regarding the context of the conference. Users, also referred to as members of the community and visitors of the conference website, are the *"ultimate judges of the information environment"* - Rosenfeld, L. et al. (2015).

The analysis began by acquiring information from online sources and research meetings with the case representative, in order to understand who the users were. It was established that the targeted users could be placed into two general groups: industry and academia. The industry consisted of companies, looking for networking and project collaborations, while academia included researchers looking for updates, inspiration or networking. What provided more understanding of the user was gathering of information about their activities throughout the year, discussed in section *4.1 Context Analysis*. According to the research, users' activities could be identified as several kinds: acquiring general information about the conference; writing, submission, and reviews of papers; obtaining information about program, hotel venues and social events; registration, which would be available throughout the whole course; and access to documentation of images and other media from the conference after the event. These activities had to be further explored and seen through the eyes of the users, in order to complete the opportune moments and form a persuasion strategy.

The users have different information needs, and these needs depend on the user group, place and time of the year. For instance, the authors who write and submit papers (or posters) prioritize information regarding submission deadlines and review dates long before the conference event. While companies looking for project collaboration for instance, prioritize on the various events and program related information, happening near the conference event. In order for the information needs to be addressed correctly, they need to be selected and filtered by the users themselves, for instance, in the beginning when interacting with the platform. In addition, the system can explore the user interaction with the system to additionally identify relevant information. Providing the users with means for selecting the information they are interested in, would ensure that the right information reaches them at the right (opportune) time.

4.3.1 Survey

A survey was employed in order to further address the question of who the users are and why they would be interested in the event. The survey was sent to researchers and practitioners, who are members of the persuasive technologies community. They were considered the main target audience, since they possess knowledge of the whole process and can share their experiences with the conference event and the system. Furthermore, the survey was sent online by email, due to the fact that the users are an international audience located in different countries.

The focus of this method has been to get insights of what benefits the conference offered to the attendees from their perspective and also what made it attractive for them. In addition the survey focused at discovering what information users were missing throughout the year. In order to obtain that

information I designed a *mixed survey*, which included both open and close-ended questions. As stated in the methods chapter, the open-ended questions aimed at allowing the users to openly answer the questions with their own words, providing a richer data. On the other hand, the close-ended questions in the survey aimed at reducing the complexity of the method by providing predetermined answers for the users to select from. The method was chosen in order to reach a higher number of responses from community members from around the world, and gain various perspectives.

The survey extracted information about the frequency of use of the conference website, where according to the statistic *(Appendix 5A)*, 1 out of 6 participants were regular visitors of the website, while the rest visit the website occasionally. As a consequence, it was a clear indication that the platform was not used on a regular basis by the majority of the participants, as they used the system when there were certain information needs.

The second step was to determine the participants' needs of using the conference website. It was noted that all of the respondents answers were related to information about dates, deadlines and schedule for the event, as main reason for visiting the website *(Figure 8)*.
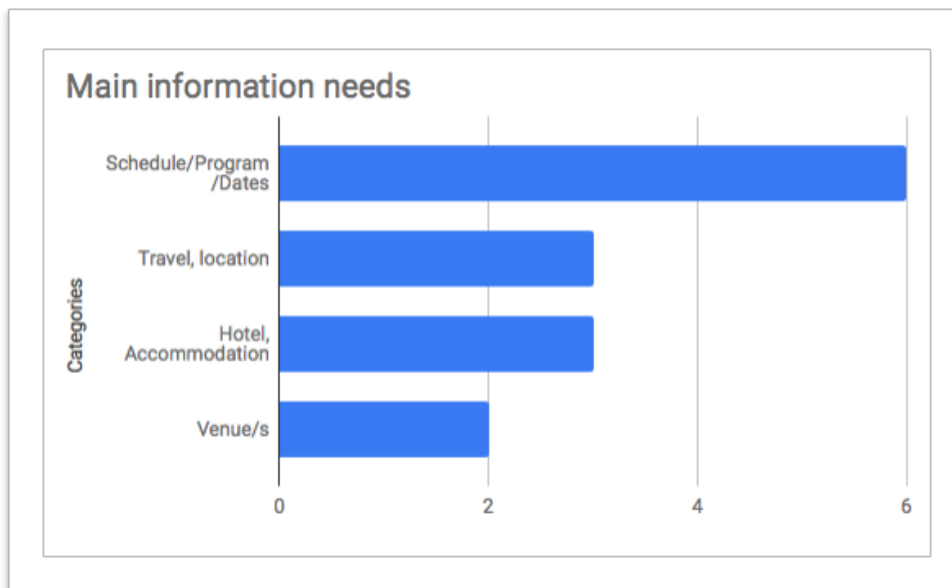

Figure 8. Bar Chart of main information needs when visiting the conference website.

Other shared answers included information about location, traveling, venues and general conference related information. One participant answered that their reason for using the website could vary- *"this depends on my role each year, if I'm organizing something, presenting something, or just visiting" (Appendix 5B)*. This statement confirmed that different user groups have different information needs.

Moreover, one of the weaknesses of the heuristic evaluation method is that most of the time evaluators are not the actual users of the platform, which indicated that what might be considered as a problem for the users, might not necessarily be considered as problem for the evaluator and conversely. Therefore, the qualitative survey aimed at capturing this issue by including questions about the usability of the platform, and exploring whether users were missing or having difficulty of discovering information. As a result, it was observed that two of the responses addressed a problem of not finding information about certain dates of the event, nor program related information: *"The last time I checked, about two weeks*

ago, there was no program-related information to be found", another participant added *"in what dates certain events take place" (Appendix 5C)*. This might be a point of consideration, where preliminary program information could be included earlier in the process rather than near the conference event.

The next step was finding out what makes the conference interesting for the participants according to their view. For that purpose, open-ended questions were used to gain feedback and chance for users to describe what they experience with their own words, without placing constraints on their answers, as it would have been with close-ended approach. In order to extract the information from the qualitative data, all the individual answers have been placed in Google Sheets, where response categories have been identified, by looking at answers with the same meaning *(Appendix 5D)*. As a result the qualitative data turned into quantitative one, which allowed for measuring the different interests and grouping them according to the responses given *(Figure 9)*.
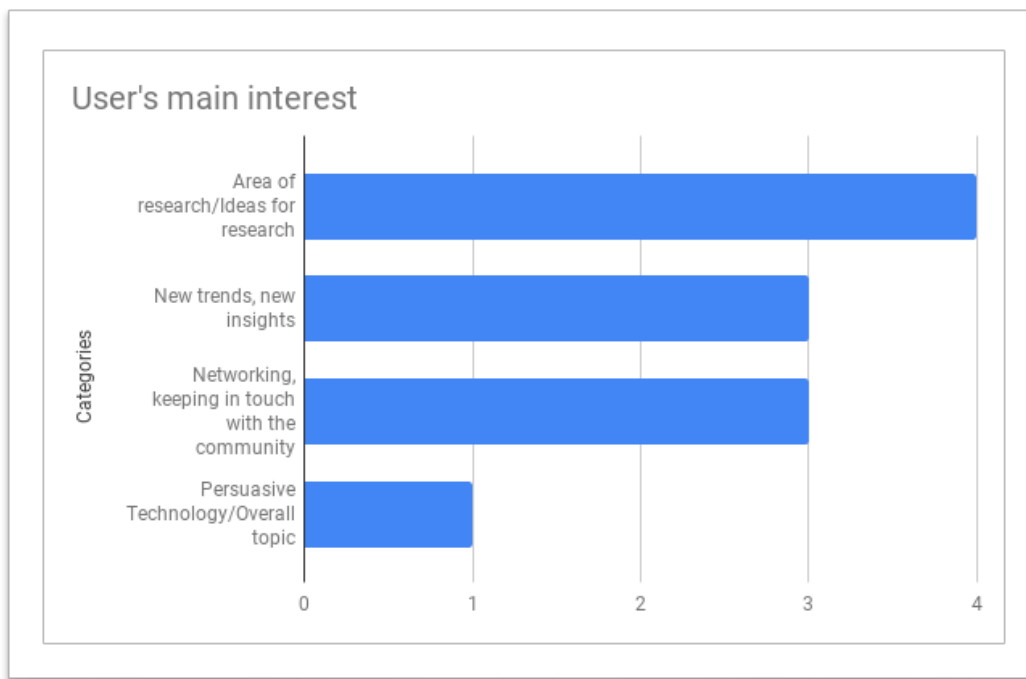

Figure 9. Bar Chart of most common interests of participants at the conference.

The figure illustrated some of the reasons why the conferences were interesting for the participants, where the most common answers were that the conference is related to their research area; provides new insights and knowledge of new trends; and allows for networking.
According to participants, one of the main benefits of attending the conference as a newcomer is the opportunity to get to know people from the field and build a network. Other benefits include introduction to the field, gaining inspiration from others, as well as presenting own work and inspiring others.

Lastly, the the majority of participants indicated that they would like to receive additional information, such as conference dates and deadlines, where 50% chose *email* as preferred source, 33,33% chose both *email* and *mobile notification* (all of the above), and 16,67% did not need additional information *(Appendix 5E)*. The answers indicated that the majority of users were open to receiving this type of

information through other sources than the website, as it might be easier for them to be reminded rather than having to remember, where prompts might be useful.

4.3.2 Card-sorting

After gaining quantitative and qualitative information about the participants' usage of the website and their interests and motivation towards the conference, I needed to better understand their information needs in relation to the conference platform. Moreover, the organization and labelling of content is related to the perspective of the one who organizes the environment, and people have different view of what makes perfect sense. For that reason I employed the method card-sorting, since what made perfect sense to the users might be different than my vision of the organization of content.

As defined in section *3.4*, card-sorting helps in seeing how users perceive information by allowing them to group and categorize information written on cards. The purpose of the method was to gain understanding of how content could be grouped and categorized in a manner that meets the user expectations. *Open card-sorting* allowed the users to group the content and name these groups according to their own viewpoint, where the cards consisted of content from the existing websites. Before the actual test, a pilot test was performed to eliminate major errors from occurring on the actual session. In contrast to *individual* card-sorting, which would have been performed on one participant at a time, the method was performed in *group* where 3 participants have had a discussion over how information could be structured. The discussion has been recorded, while allowing for more thorough observations of the card-sorting, and follow-up questions for the participants. A discussion was considered more valuable, as it contributed to the research with insights on how the users see the processes of writing paper and interacting with the website platform, as well as obtaining additional suggestions for conference activities.

The participants were actual members of the community, who to some extent could be considered as domain experts, since they know the work environment and have detailed knowledge of the tasks and processes of the event. With this in mind, the participants would have good understanding of how the information environment for conference event might be structured according to their information needs.

Several observations were made during the sorting and discussion process. According to the participants one of the strong sides of the conference is the networking opportunities. Some of the more effective social activities allowing for networking, as stated by the participants, are the poster and workshop sessions, as they enable people to discuss topics of common interest. During the discussion, the participants came up with additional idea for social activity (project speed dating), which allows for more networking opportunities such as project collaborations or finding of consortium members for projects. This might also be appealing for the industry audience, as they would typically be looking for practitioners with ideas. However, the project speed dating would also be appealing for academia, who might be curious to come even without having written a paper. Furthermore, newcomers would benefit from that activity as it might be a way for them to present themselves in topics they find interesting. As an addition to the networking activities, demo sessions was a different topic that arouse during the discussion, as another process for attracting industry people to attend the conference event. These new

activities were discussed by the participants as a way to increase the social interaction and networking at the event.

During the session, some of the participants shared their very first information needs, when the information about future conference appears. *"The first thing I would look at is, first of all where is it, is it at a nice place, at a nice time of the year. The second thing, what is the theme… ".* All the participants could agree that one of the first things, especially for newcomers, would be to look at the theme of the conference. However, this information did not appear to be of priority for the past three conference website versions, and rather than making the information as central, it has been placed further into the hierarchy of the website. Moreover, the last website has no specification of the selected theme, in other words, that information is missing. In order to draw new audiences towards the conference, this kind of information would need to be more accessible.

It has been noted that the process of accepting papers for the conference is rather strict, since the selected submissions are being published in a highly regarded publishing agency. This meant that many papers are being rejected, and one of the participants mentioned that this could be a factor, which prevents people from attending the conference. However, the discussion also provided knowledge that there is a possibility for the authors, whose paper has gotten rejected, to submit as a poster. That information was something that past website versions were missing as well, and an additional factor for inviting people, even the ones whose paper has been rejected, to join the conference.

During the card-sorting session, the participants provided valuable insights into missing information and also added 12 more cards to the discussion, marked in green *(Appendix 6)*. As an example, "*Publication options"* would provide the information that, except for being able to get a publication through papers, people could also publish through having workshops on the event. Another card "*Student submissions"* has been created in order to make the conference more appealing to students, who might otherwise not have the knowledge or motivation when looking at the website.

The card-sorting outcome from discussion only confirms that there is missing information in the previous websites. By including all the missing information from the discussion, the new platform would be more informative and inviting towards the different audiences.

4.3.3 Semi-structured interview

In a similar manner to the discussion by the participants in the card-sorting, the semi-structured interview was audio-recorded, transcribed and analyzed. In order to make sense of the data in a more thorough manner, the analysis occurred by familiarization with the data, generation of codes (brief descriptions) of textual data, and identification of main themes and significant facts found in the transcribed text (Mortensen, D., 2019). This process was inspired from thematic analysis, which characterizes in outlining ideas and locating meaning within the data. These ideas are turned into themes through representative codes (descriptions) serving as summaries of information (Guest, G., MacQueen, K. M. & Namey, E. E., 2012). The method is considered as one of the most common in qualitative analysis, and as stated by Guest, G., et al. (2012) - *"… is still the most useful in capturing the complexities of meaning within a textual data set"*. The analysis has been inspired by this method in order to obtain a

more structured and systematic approach to analyzing the data and presenting it in a more efficient manner.

The first step consisted of exploring the data in detail by listening to the audio recording and transcribing it into a text document. By doing so, it was easier to get an overview of all the information, which allowed for making notes and extracting initial observations of reading the data. Since the method was semi-structured interview, there already was an idea of what kind of information the interview needed to extract. However the approach was also exploratory in areas, which have not been tackled by the participants back in the card-sorting discussion. Aspects of the mobile platforms and notifications have also been explored. After the data was inspected in greater detail, initial ideas have been noted down. They were considered relevant for the formation of codes and creation of themes. The second step consisted of generating initial codes, in order to summarize what has been said on the interview. The codes represent descriptions, which could be grouped by similarity, as they are the components forming a theme (Guest, G., et al., 2012). Consequently, the third step involved generation of themes, by grouping of codes together, and labeling of the groups to develop broader interpretation of topics (Mortensen, D., 2019). The four main themes found in the interview transcription were:

- *personal motives* with sub-category *additional motivation factors*
- *main tasks on the website*
- *mobile platform*
- *notifications*

Starting with the **first theme**, some of the main personal motives for the participant to attend the conference were in relation to their research, as a master and later as PhD student. The participant further clarified that motives for attending the events were the community and publishing research: *"So in the beginning that was my main motivation to go there, was sort of the community, to be part of that. And then the last time I was there to publish" (Appendix 7, Q. 3)*. Following the current theme the participant was asked for example of criteria for not attending the conference. *"For me I guess, that's very individual, but for me it's also about distance. So it does move around a bit and sometimes it's in the US and I have to prioritize where to go because of funding etc." (Appendix 7, Q. 4)*. As a result, it was noted that distance, and more importantly funding, were two aspects playing a major role in the decision-making process for attending the conference event for the interviewee. Another observation was that the participant considered the conference most appealing because of its small community and the fact that everyone was speaking "the same language" and having "shared understanding of the field". According to the respondent, motivational factors were mainly the funding and event activities, where especially for students, these factors were the doctoral consortium and publishing of their paper.

When it comes to the conference website, the **second theme** was represented by the tasks, which the user normally performed on the platform. Upon inspection of the data, couple of observations were made when defining the theme. On one hand there were variety of tasks the user performed on the platform, while on the other hand, these different tasks were performed at different times of the year. This observation led to the creation of sub-themes, considered as "phases", which were happening before submission of papers, after acceptance of papers and around the time when the people would be going to the event.

According to the interview, in *phase one* (decision phase) the participant looks for general information such as the conference theme, the venue, location, submission information and potential workshops to visit. This phase is also when students look for benefits of attending and submitting papers. In addition, the decision phase includes the search for information related to funding, since it has been stated both in the card-sorting discussion and in the interview, as one of the motivational factors for attending the event.

Phase two (planning phase) the participant typically explores the practical information about the conference. For instance- details about the location/city, booking of flights and hotels, selection of relevant presentations, workshops and tutorials to attend, as well as details about social events and places to see, in order to plan the individual days.

Finally *phase three* (conference event/attending phase), which would occur around the time of the event, involves schedule planning for where to go and who to meet. Additionally, checking program details and finding specific locations (such as meeting rooms and the places where social activities occur) is another task for the user of the platform. The participant also characterized their frequency of visits on the website as *"Often, for a very short time" (Appendix 7, Q. 7)*, which meant that information for them had to be well structured, but also minimalistic, including the most relevant information.

The **third theme**, *mobile platform*, looked at the experiences the user had when accessing the persuasive technologies conference or any similar conference event through their mobile device. It was noted that the user most likely accessed the information through their smartphone during the time they travel *"... that's usually my main platform when I'm traveling, because it's so much easier…" (Appendix 7, Q. 11)*, or when they were not in the process of working, since working would usually be carried out on their computer. Identically, the participant preferred to use mobile access when they were located at the event, which was also the response from the research meetings conducted with the case representative, confirming that it would be a lot easier to quickly check relevant information on the spot, rather than doing so on computer. And, as found in the heuristic evaluation, the current website had major errors and did not support the mobile platform, which prevents users from seeing the full program related information. These findings led to the belief that mobile access would be crucial for users. Furthermore, according to the participant, one of the main traits for using mobile device has been the easy access of information, as that would most commonly be when located at the event. As stated by the interviewee, the app should include a thoughtful functioning design- *"So if it looks really nice but it does not work, then I will not use it at all. So functionalities over aesthetics for sure" (Appendix 7, Q. 15)*.

One of the questions addressed the topic of missing or difficult to find information for the participant. A clear impression that they remembered having, was about finding the exact locations of events on the program, since some of them have been at different physical locations. *"That was very difficult actually, to find out how to get to that other place… and how to get around there and so on. So I remember that, still…" (Appendix 7, Q. 9)*. With this in mind, visiting the current program page on the website, only the names of the meeting rooms have been provided, with no additional information about exact location. According to the interviewee, one of the things that would be very useful would be having the exact locations of each session of the conference specified, while also mentioning what they would mainly use the mobile access for: *"Something that helps you navigate when you're at the conference, I think is the main thing that I would use it for" (Appendix 7, Q. 16)*.

The **fourth theme** identified from the interview was *notifications* and it explored the user's opinion on receiving mobile notifications and interesting for them information in relation to this topic. At first it was stated that notifications were usually ignored by the user, however, it was also claimed that they were useful for newcomers for announcements or invitations to join activities. The participant shared that they usually allowed notifications, however, if these notifications were too much or irrelevant, they would turn them off, while on the contrary *"…if the first few notifications that I get are things that I appreciate knowing and that are relevant, then I would be more, sort of, inclined to keep it like that." (Appendix 7, Q. 19)*. Following up on the answer, the participant was asked if they could provide examples of such information, which would be relevant for them. Several individual information needs were revealed, all of which were related to updates of certain information.

One of them was need in the decision phase, such as receiving notification when papers have been reviewed. Others were related to the planning phase, such as when the program has been uploaded, or if there were changes, or if hotels were fully booked. And others during the conference event phase, such as changes in the program, cancellations, and social activities for people who attend the conference alone. The participant considered these types of notifications on their mobile device as relevant and useful to know, as it would directly address most of their information needs. Important to note was also that some of these notifications would be expected as an e-mail notification as well, since not all users would allow them on their devices.

4.4 Outcomes

This section combines the findings from the analysis and serve as an overview of the methods applied throughout the research. The context analysis provided understanding of the meaning behind Persuasive Technologies community and their processes throughout the year. Together with analyzing the persuasion context, the analysis delivered the intent, audience for persuasion and the persuasive message which would be transmitted. The content analysis captured all the information from the past website versions and identified errors in the current mobile system, which require reconstruction for the new platform. The user analysis involved the actual users of the system, and identified their perspective on structure, information needs and main interests in the event. Finally, all the outcomes contribute to the progression of a strategy in the form of requirements for the development and design of structure and interface of the new digital system for persuasive technology 2020.

4.4.1 Method outcomes

The outcome of the *heuristic evaluation* established that the latest website platform (2019) included all the heuristic principles and had considered past mistakes from previous versions. In order to meet the goal of expanding the community, however, the platform needed additional information which addressed the new visitors as well. However, when it comes to the mobile device access, the method identified major errors, where 5 out of 10 heuristic principles were missing. As stated in the user analysis, mobile access was crucial, especially near the time of the conference event. Therefore these major errors had to be considered in the new platform, in order to make the system more friendly and accessible for users, and thus, allow for persuasion.

Consequently, *before-and-after benchmarking* allowed for better understanding of the context, content and structure of the existing information environments for the conference websites in the past three years. This was supported through applying a top-down and bottom-up information architecture approaches, seeing the way information is organized from the top to bottom level of the hierarchy. The method discovered that the platform was not informative enough for newcomers. Additionally, it provided ground to learn from past successes and errors, making the method a great point of reference for the organization of a structure and designing of the new interface.

The last piece of the research puzzle was involving the actual users of the system and exploring both quantitatively and qualitatively their personal interests, information needs and motivations in attending the conference event.

The outcome of the *survey* led to discovering of several findings. Firstly, the majority of the participants were not using the system on a regular basis, indicating that they use it only when having certain information needs, thus the system required persuasion for engaging users and inspiring them to attend. Secondly, using open-ended questions, the method discovered some of the main information users look for when browsing the system. In addition, the approach explored the users' main interests regarding the conference and grouped the findings into similar categories, illustrating some of the reasons why people would be interested in attending. Finally, it was noted that the majority of the participants were prone to receiving additional information, such as important dates and deadlines, in the form of e-mail and mobile notifications. Together with the knowledge of certain information needed at certain times of the year, the use of notifications allowed for consideration of the opportune moments to persuade users in fulfilling the intent.

The *card-sorting* explored more in-depth the information needs of users, by allowing them to openly discuss while grouping and labeling content according to their own perceptions. During the discussion, the participants addressed an issue with networking particularly for newcomers, who were attending the event alone. Since networking is one of the main traits of the event, the community needed to address newcomers in order to expand and grow- not only on their digital platform, but also the event. As a consequence, additional networking activity has been included in the program. Furthermore, participants shared their very first information needs for the next conference event and some of the factors which influenced their decision on whether or not they would attend. It was noted that information, such as conference theme, should be more central and accessible in the platform. Except for delivering a clear image of how the users would group the information of the system, the participants also added 12 more cards of content, which were considered in the content organization process in the design stage.

Finally, the *semi-structured interviews* supported the previous user research, by qualitatively exploring the user needs more in-depth and obtaining an additional perspective to the research. The method provided insights into information, important to consider when aiming for motivating people to go to the event. According to the interview, some of the motivational factors for various users to attend included funding and event activities. Moreover, for students, main motivation represented the doctoral consortium and submitting and publishing papers. This type of information was essential for the persuasion plan.

The interviewed also addressed a problem they had with finding specific locations of event activities. This was also observed on the current mobile platform of "Persuasive2019", where some of the meeting rooms in the program were not visible when accessed through mobile. Therefore, navigation help was necessary in the new platform. The semi-structured interview also led to discovery of information, which the participant considered relevant to be notified for.

Lastly, the method confirmed three different phases occurring at different times before and during the event, closely related to the activity process introduced in the context analysis- *decision*, *planning* and *attending* phases. These three phases represented tasks the user performs in the system and the time when they execute these tasks. These details reinforced the knowledge about the opportune moment, by allowing the delivery of relevant information to the user. The content of these three phrases would also be included in the following section.

4.4.2 Year Wheel Information Process

An year wheel was built, based on the combined findings of the *research interviews* from the context analysis, the *card-sorting* discussion, as well as the *semi-structured user interview*. The year wheel demonstrates the important events of different activities and processes throughout the year, where the starting point is April 2019, after the last conference has ended. In addition, the wheel serves as a point of reference for the design stage, as it considers the type of information most relevant for users for specific time of the year *(Figure 10)*.
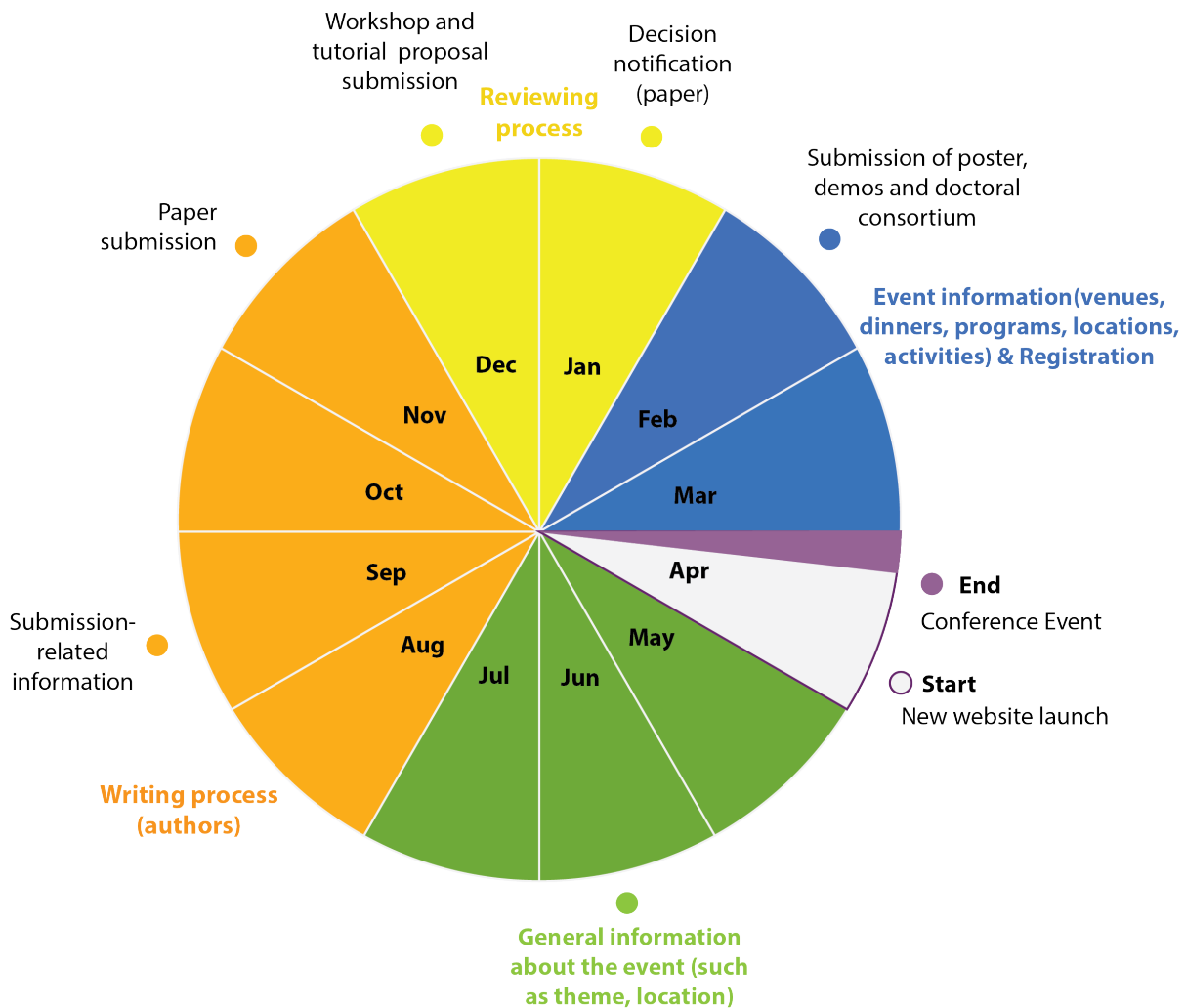
Figure 10. Year wheel of Persuasive Technologies community

The starting point is where the website for the next year's conference would be up and running and provide general information (**first** point of information) about the upcoming conference in 2020. That information includes the city, locations, theme of the conference, and the aim is to appeal to the user's interest, inspiring them to attend the event. Registration would be available all the way from the starting point of the platform. The **second** point of information is when authors are writing usually after the summer, and submitting and reviewing papers around the November, which usually occurs when the paper submission deadline takes place. Afterwards, around February, comes the **third** point of information where information is shifted more towards the event itself. This includes venues, dinners, programs and similar information which arises interest. Finally, the year wheel captures the *decision* and the *planning* phases found in the semi-structured interview, which occupy the wheel all the way up to March. While the third phase (*attending*) is at the time of the event (April).

As a conclusion, depending on where the year wheel is located, people's information needs change. That means that the information needed to adapt and be communicated to the users at the identified points of time from the year wheel. Moreover, as it was pointed out in section *2.1 The Cross-field*, in order to identify kairos, the research required recognition of when the timing was right. The year-wheel was

developed to address the right time, which allowed the consideration of the opportune moments to apply persuasion.

4.4.3 Design Requirements

As a human-centered process, *requirements engineering* (RE) has been leading the way of identifying users and their needs (Nuseibeh, B. et al., 2000). RE has also been applied in order to address the problem, and deliver documented design requirements for the planning and development of the new platform. The following figure *(Figure 11)* represents a strategy table, which includes an overview of design requirements based on all the outcomes taken from the analysis. In addition, the first row of the table also specifies which method was responsible for each specific finding.

Finding	Conclusion	Implementation
One of the first things users look for on the new platform is the theme of the conference. Yet the theme was not found on the current website. *(Card-sorting, Benchmarking)*	Information that users look for initially should be more central and accessible on the platform.	A short description of the theme on the homepage of the system.
Missing information for newcomers *(Before-and-after Benchmarking, Card-sorting)*	The platform requires additional information, which is more informative and inviting for new audiences.	Implementation of section informing the users about the conference, community, and purpose of the event.
Global navigation menu does not expand unless users tap on the "+" button (mobile version). *(Before-and-after Benchmarking, Heuristic Evaluation)*	Some users might not be able to open the submenu when tapping on the textual description, as the "+" icon is very small. They might not reach the target destination in the system.	Implementation of global navigation, which is more intuitive for users.
Only half of the program page is visible. Additionally, half of the page for register fees is also missing (mobile version). *(Before-and-after Benchmarking, Heuristic Evaluation)*	Attendees of the conference event would be unable to check full program and payment related information from their mobile device, unless they use a computer device.	Consider current errors of the system in the development process of the new system and prevent them from occurring.
User shared their experience of having difficulties finding location of activities. In addition, the system did not indicate how people can reach the specific location of events. *(Semi-structured interview, Heuristic Evaluation)*	Users will benefit from navigation help around the time of the event.	The locations could be in-text hyperlinks, which display a map of the exact location of the chosen event.

Global navigation icon is not available when scrolling down on pages. Back to top button is only located at the bottom of the page (mobile version). *(Before-and-after Benchmarking, Heuristic Evaluation)*	Users need to scroll all the way back to the top, in order to open the global navigation menu. In addition, back to top icon is another accelerator, which could be used by more experienced users.	Sticky global navigation bar, which would be available even when users are located further down on the page.
The system does not support help and documentation. *(Heuristic Evaluation)*	Help and documentation can be helpful for users who need more detailed information.	Frequently Asked Questions (FAQ) section can anticipate relevant information and provide description in greater detail.
Users are open to receive additional information and prompts at certain time before and during the conference event. *(Research meetings, Survey, Semi-structured interview)*	Prompts for valuable information serves as reminders, but could also be used as motivation factor. Moreover, it provides a window for the system to be more persuasive.	Information communicated to users through the use of mobile notifications (if allowed by the user).

Figure 11. Design requirements table

This section served as an overview of the applied research methods and outcomes, together with providing a strategy for the new platform of persuasive technology 2020. The strategic table framed the required design deliverables, building the bridge (strategy) between the *research* and *design* stages of the information architecture process.

5. Design Proposal

Moving towards the design phase required continuous journey back and forth between research and design, in order to be able to address and integrate all of the findings from the analysis of quantitative and qualitative data. This chapter outlines the planned structure of content for the new platform, together with the development of user interface for mobile device, which reflects the research outcomes. The designed interface employs various design methods for the progressive web app development stages, making use of the information architecture components as a ground basis for implementation of the design requirements from the strategy phase. Finally, the new system employs the Persuasive Systems Design (PSD) model in combination with the knowledge gained from the research, in order to build on a persuasive layer and therefore, make the design persuasive.

5.1 Sitemap

A *sitemap* is a visual representation of how the top level information components (pages) are connected in the system, considering the navigation, labelling and organization systems (Rosenfeld, L. et al., 2015). The map also served as the final ingredient of the strategy phase, where structural ideas were shaped based on research outcomes.

In accordance with the research and analysis outcomes, this stage began with the foundation of good information architecture (Rosenfeld, L. et al., 2015), represented by the designed hierarchical structure of the new system *(Figure 12)*. In this case, the top-down approach served as the guide for designing the prototype, by allowing a complete view of the top two levels of content.
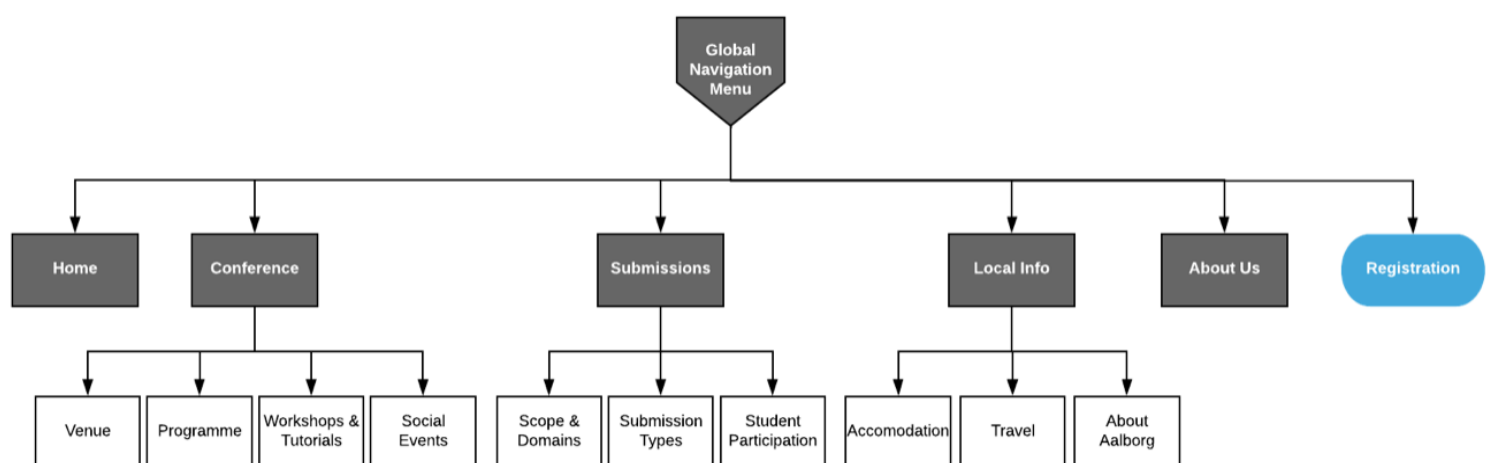

Figure 12. Sitemap of the new structure.

The organization scheme considered for the structure is *ambiguous*, meaning that information is divided into categories defying exact definition (Rosenfeld, L. et al., 2015). Unlike its opposite type (*exact schemes*) who organize content alphabetically, chronologically or geographically, *ambiguous schemes* help users navigate when they are exploring content or are unsure of the correct labeling. Back in section *4.2.2* the type of ambiguous scheme was identified as *topical*, and the new prototype structure followed that example, since it was considered as most relevant for the variety of users.

The highest hierarchy level represented the *global navigation* (also called menu) of the prototype, which can be accessed through any page of the system. It helps users understand their location and where they could go from there. The secondary level of hierarchy provided the sub-topics. The aim was to balance the breadth (number of options available) and depth (number of levels) of the structure, which prevents overloading users with too much information at a time (Rosenfeld, L. et al., 2015).

Three methods, previously applied during the research phase, had a strong influence on this outcome: heuristic evaluation, before-and-after benchmarking and card-sorting. The first two methods evaluated and learned from the existing information environments quantitatively, where all the three past website versions have been analyzed. The developed structure was also supplemented by the qualitative method card-sorting, which contributed with bringing the user perspective in the process, where the participants' ideas of grouping similar content was considered. Furthermore, card-sorting influenced the labelling of the boxes of content. All three methods discovered missing information in the system, where some examples of newly included information were *Student Participation* (relevant information for students) and *About Us* (background information about the community) pages. A more informative map has been created to visualize what type of information could go in each of those pages *(Figure 13)* below. Missing information discovered during the research has also been added to the map.
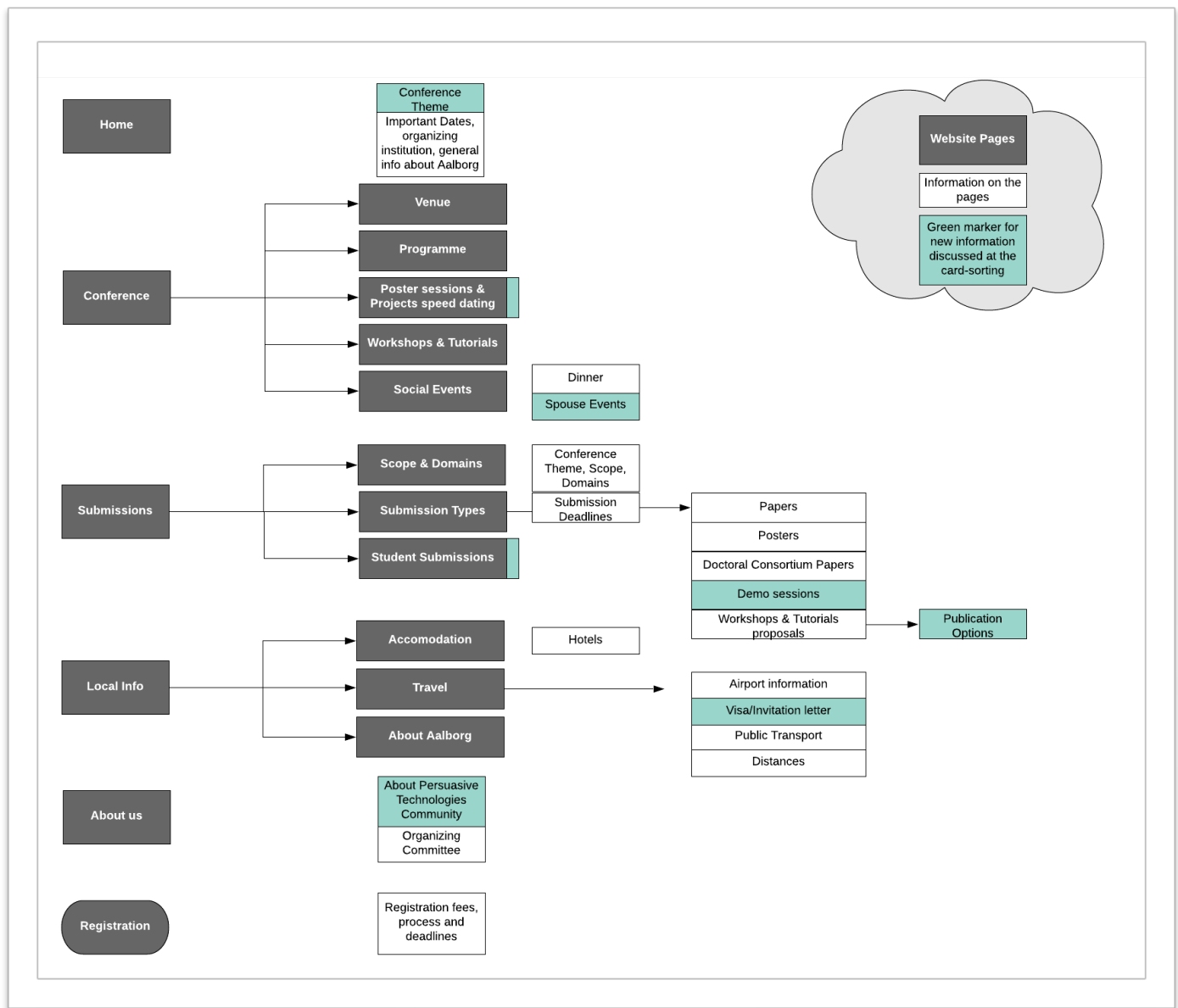
Figure 13. Sitemap of the new structure,
together with the information plan for the pages.

The map demonstrates the new structure of the system and the kind of information, which can be found on each of the pages, together with the new information discovered during the research phase. The new information has been marked in green, while the green marker also included two of the secondary hierarchy level pages (Poster sessions & Project speed dating, as well as Student Submissions). These visualizations, and more importantly the green markers of new content, were the outcome of the discussion carried out in the card-sorting session.

As a consequence, the structure has a strong potential to boost the interaction with the system taking into account previous structures and user needs. Finally, the sitemap helped in addressing the design requirement for implementation of missing information relevant for newcomers. The next step involved the creation of a mobile interface, where the new structure could be integrated.

5.2 Wireframes

While the sitemaps provide structure and representation of how content should be structured and where it should go, wireframes allow visualization of the way individual pages should look like, and where structure and content should be included (Rosenfeld, L. et al., 2015). A very common practice in the back stage process of designing a product, is to take the research insights and strategy outcomes on paper, before the integration of ideas in a design program. This is because the idea generation process is much quicker to work with, when sketching (or wire-framing) is involved, rather than it is when striving for perfection early in the process with design elements and fonts on the program interface.

This stage was used as an idea generation process, where initial interfaces of the mobile system were created. In the current case, the goal of the wireframes has been used to 1) quickly generate ideas of the design elements and structure of the interface, and 2) address the design requirements developed in the strategy phase in *section 4.4.3*. This approach allowed the consideration of mistakes early in the process, rather than having to deal with them later when a more final look has been created. This is due to the fact that stabilizing design flaws at a later stage of the design process requires more time. In addition, the wireframes allowed the grouping of content, prioritizing and moving of information in a quick and efficient manner, which are the characteristics of a low fidelity design.

Initially, the wire-framing process included the sketching of ideas on paper, and looking how information could be integrated on the Home and global navigation (menu) pages, where images of mobile phone have been printed and used as a frame to draw on *(Figure 14a)*. In addition, the process between the sketch and the digital wireframe went through several changes, the outcome of which reflected on the digital wireframe versions *(Figure 14b)*.
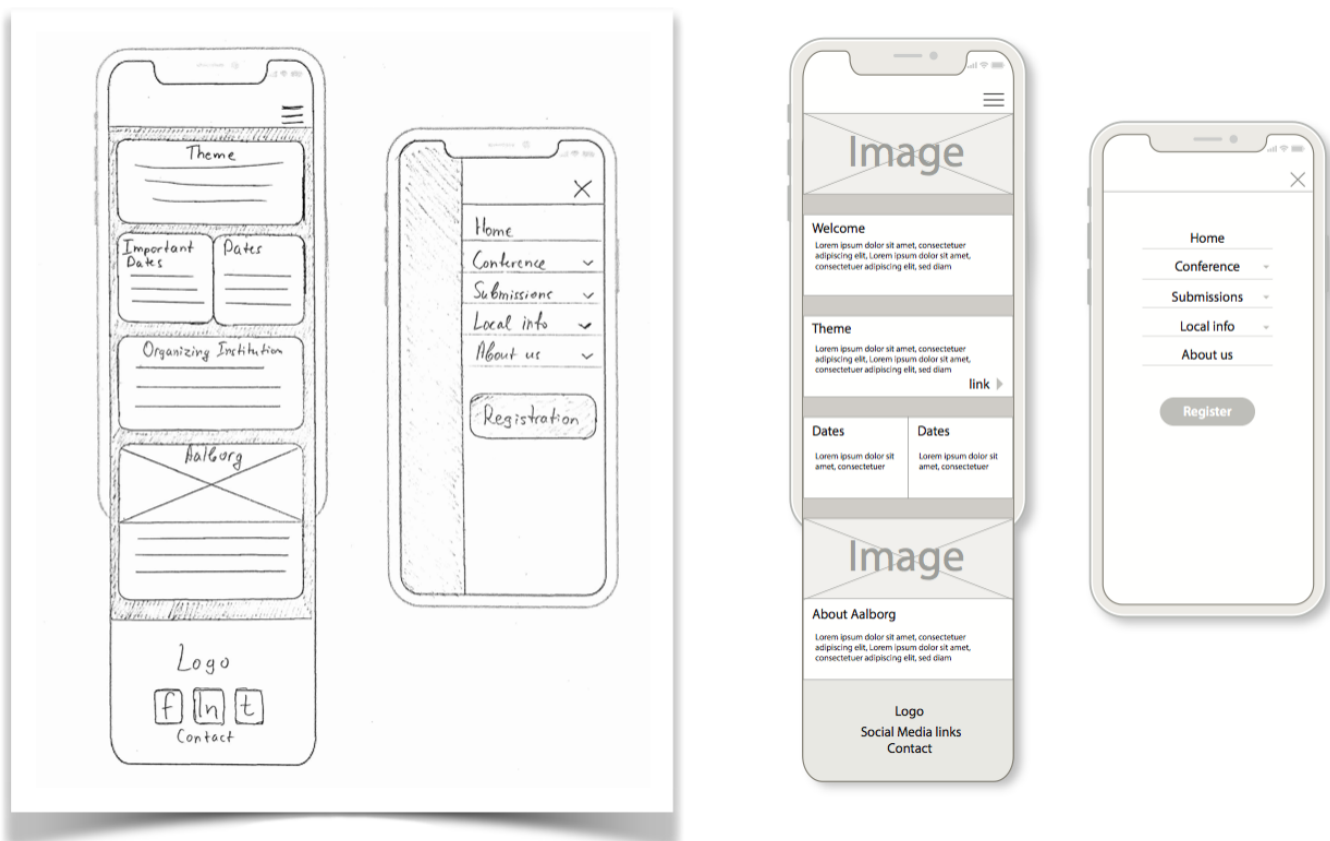

*Figure 14. **a)** Paper Wireframes of Home and Menu pages. **b)** Digital Wireframes of Home and Menu pages.*

During the wire-framing, it was important to balance the amount of information given to the user at once, which was why the prototype aimed at providing simplicity and variety. The initial sketches mostly consisted of textual boxes, while the digital wireframe combined textual description and visual elements. The digital wireframe ended up with extended boxes (in contrast of the sketch) and visuals, in order to keep a clean interface and make the information easier to grasp for users. These outcomes were also implemented in the rest of the designed pages, and served as a template which provided consistency and standards in the interface.

During the research phase, card-sorting pointed out that one of the first things users look for in the new system is the theme of the conference, however, before-and-after benchmarking established that this information was missing from the last version, but present in the previous versions. The wireframes included the "Theme" as one of the first sections of the homepage, therefore completing the first design requirement *(in 4.4.3 Design Requirements)*. Moreover, the "Theme" box also served as *contextual navigation* link to page, where further information could be acquired. It was very important to provide the home page with quick hyperlinks, and allow *tunneling* for users to reach topics of interest more easily, as well as provide the opportunity to persuade. Applying hyperlinks on the homepage of the app was where I also noticed overlap between *contextual navigation* (information architecture navigation component) and *tunneling* (persuasive design principle). As they both allow the users to move through content and provide opportunities for actions from the user.

In addition, both benchmarking and later card-sorting methods confirmed that the system was missing information, more specifically in addressing new audiences. For this reason, the wireframes included a "Welcome" box, which has the aim of introducing newcomers to the conference and provide background information. Having this information as central on the starting page was how the wireframe implemented the second design requirement.

The global navigation has been simplified in the digital wireframe, where full screen menu has been selected in order to avoid too many elements and allow for simplicity. The *local navigation* expands under the main topics *(Figure 15)* and visualizes the secondary hierarchy level of where users could go from that point.
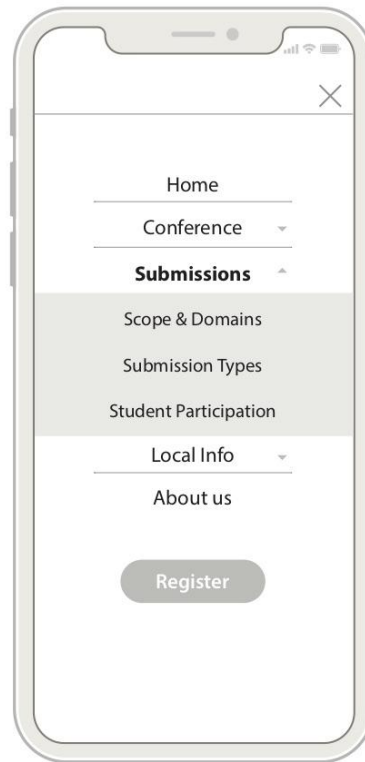
Figure 15. Wireframe of Global and Local navigation.

As previously found through the heuristic evaluation and before-and-after benchmarking methods, the global navigation of the 2019 website version on mobile would expand only when users tapped on the "+" icon *(Appendix 2A)*. In the case when the user is not an expert on mobile platform, they might not be able to open the local navigation and therefore, not reach their destination. This is a serious error, especially since the icon was barely visible on the screen. In the new version, the area where users could tap is linear from one edge to the other, while the arrows are just indicators that the global navigation could expand. This way the system enhances usability and allows for easier interaction for the user, thus addressing the third design requirement.

The labels of the structure and content were also inspired by the card-sorting outcome, however, some of them were further simplified so that they were less audience-specific and more users could recognize their meaning.

In conclusion, the wireframes provided exemplification of the location of content on the main page of the progressive web app. One of the main ideas for the home page was to include content about the conference, community and purpose of the event, in order to be more informative for new audiences. Thus, from a practical perspective, the wireframes ensured that content was correctly positioned on the interface based on the needs of the users. In addition, the wireframes presented a simple and more intuitive global navigation, where the local navigation could easily be accessed. As a result, the section demonstrated how the first 3 of the design requirements have been applied in the progressive web app.

5.3 Mockups

The wireframes produced a "template" for the interface, giving a raw idea of what the PWA should look like. This saved considerable amount of time by allowing for quick changes and adjustments on the interface. However, wireframes did not include design elements or actual amount of content, which made it difficult to capture the overall concept. Under those circumstances, the project took a more realistic perspective on the visual of the PWA through the design of mockups.

Mockups illustrate the layout, colors, typography, design elements and content within the interface of the system. Typically mockups are designed to visualize how the product is going to look like, which is what characterizes them as mid fidelity design. In addition, mockups helped in demonstrating the resolution of problems discovered during the evaluation process, which would be harder to do on paper or through demonstration of low fidelity designs. In this project, the programs Adobe Photoshop and Illustrator were used for the creation of mid fidelity designs of the progressive web app. The mockups included textual description from the old system, as well as filler texts in some places, which is not the actual content but simply used as an example.

During the research phase, before-and-after benchmarking and heuristic evaluation discovered a major error in the current website on mobile platform *(Figure 16a)*. The interface would not display the full program-related information, which as pointed during the user interview, was one of the things used for the planning phase. This is to say that when people are at the conference, they would not be able to see the full program on their mobile device. The new design of the *program* page *(Figure 16b)* has successfully resolved this issue, while also providing a more app-like style and interaction of the conference program.
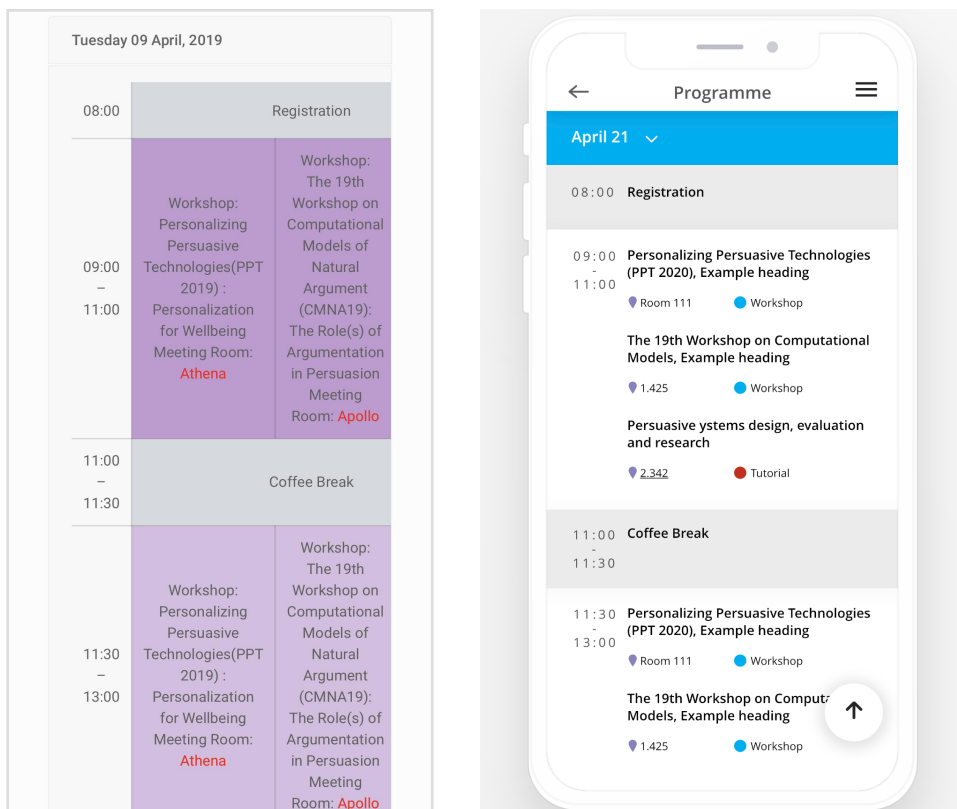

Figure 16.

a) *Current website program on mobile*

b) *New version of program on mobile*

As a consequence, the page addressed the 4th design requirement from the strategy table, by creating a fully visible program for the small screen. Furthermore, the mockups provided *breadcrumbs* found in the top of the interface, which always visualize where the users are located in the system hierarchy. The breadcrumbs also complement the resolution of the first heuristic principle *visibility of system status*.

The approach taken for the specific design of the content of the page was *bottom-up information architecture* (Rosenfeld, L. et al., 2015). Rather than having a single long description to read through, the bottom-up approach has chunked the information so that users know what specific parts of the information mean. As an example, *Figure 16b* provided a heading, location of the activity (also visualized through an icon), as well as the type of activity (workshop or tutorial) distinguished by color. The location indicators are also considered *iconic labelling* where standard icons could be recognized even without the need of textual description. Under those circumstances the users could easily distinguish the different elements in contrast of having long monotonous text to read through. Moreover, the type of activity was not the only element on this page, which could be distinguished by color.

The mockups included the different days of the conference program *(Figure 17)*, which users can browse in two ways. They can either select the day from the drop-down menu next to the date (local navigation), or simply move down the continuous page which changes the dates automatically.
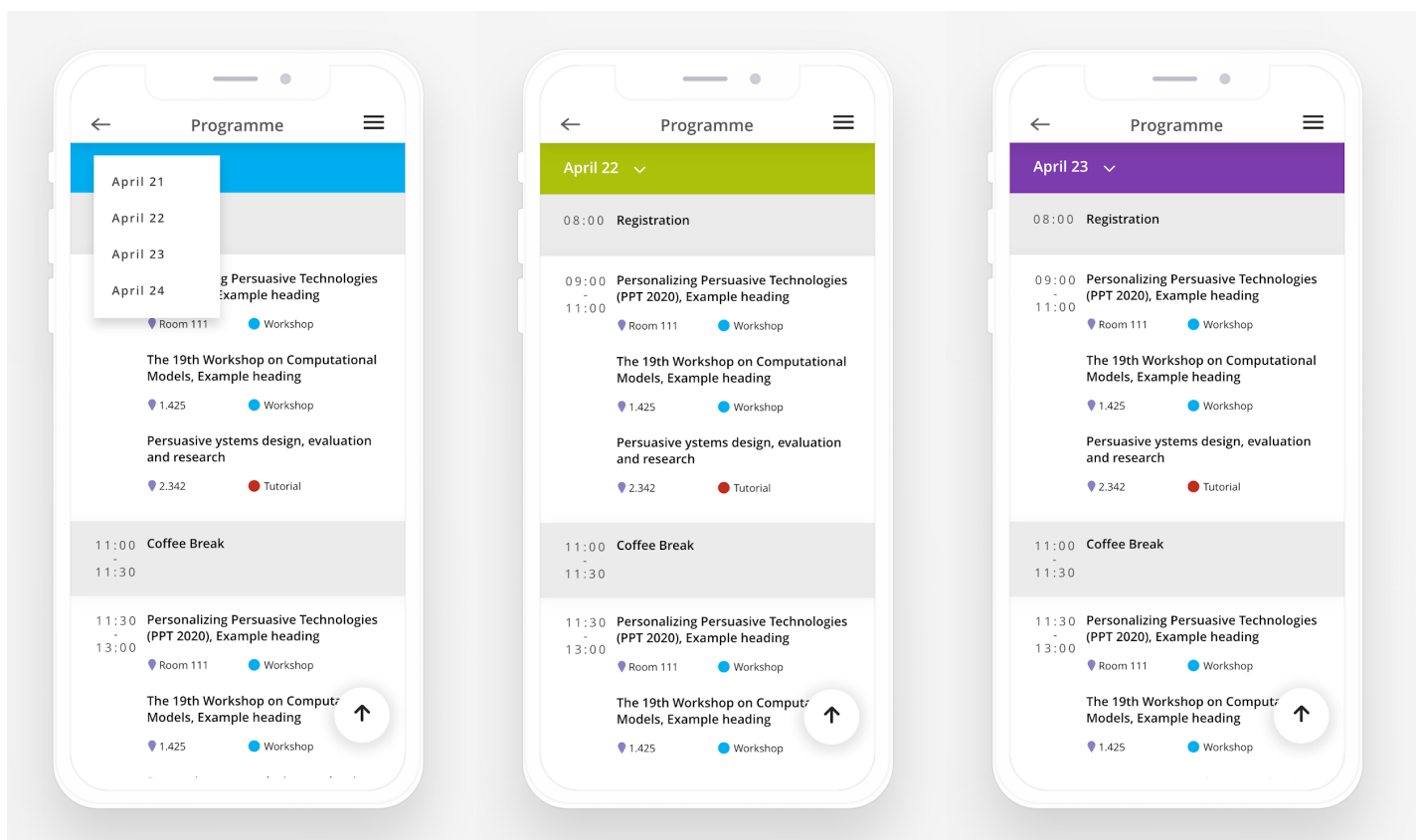

Figure 17. Mockup of the conference program days.

Hence, the two ways of browsing this type of information considered both novice and expert users, where the expert users could use the local navigation of the page to quickly navigate to the specific program day.

This page of the interface also considered one more design requirement, acquired from the user interview. According to the research, the PWA should provide means for users to find the location of specific event activities. While the current website version provided only the names of the rooms, the new system allowed users to see the rooms, however also tap on the location icon or description from the *Programme* page, and pinpoint the location on the map *(Figure 18)*.
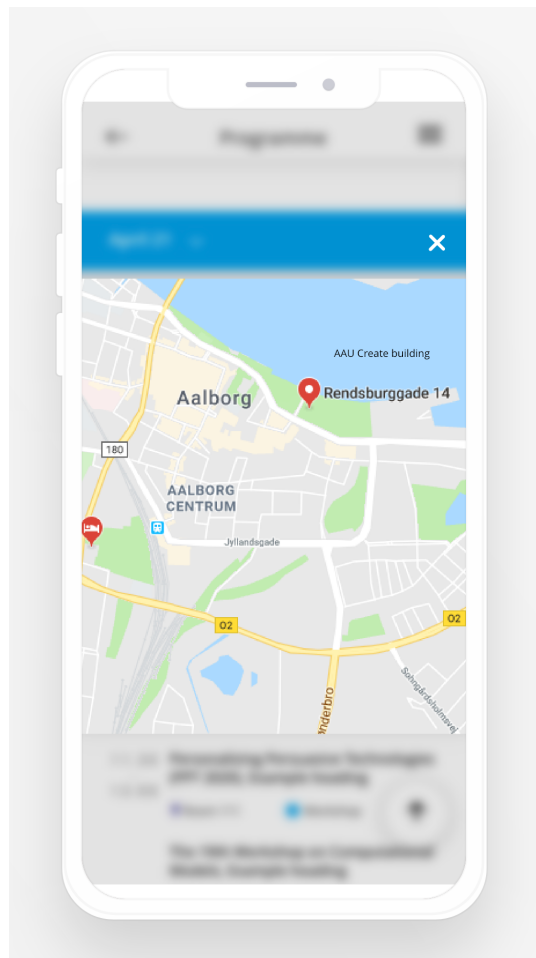

Figure 18. Location of the selected activity.

This allows the user to access the location on maps and find the best route to get there. Furthermore, additional *local navigation* bar has been included in "Workshops & Tutorials" page, where further information about the purpose of the workshops and tutorials could be discovered *(Figure 19)* below.
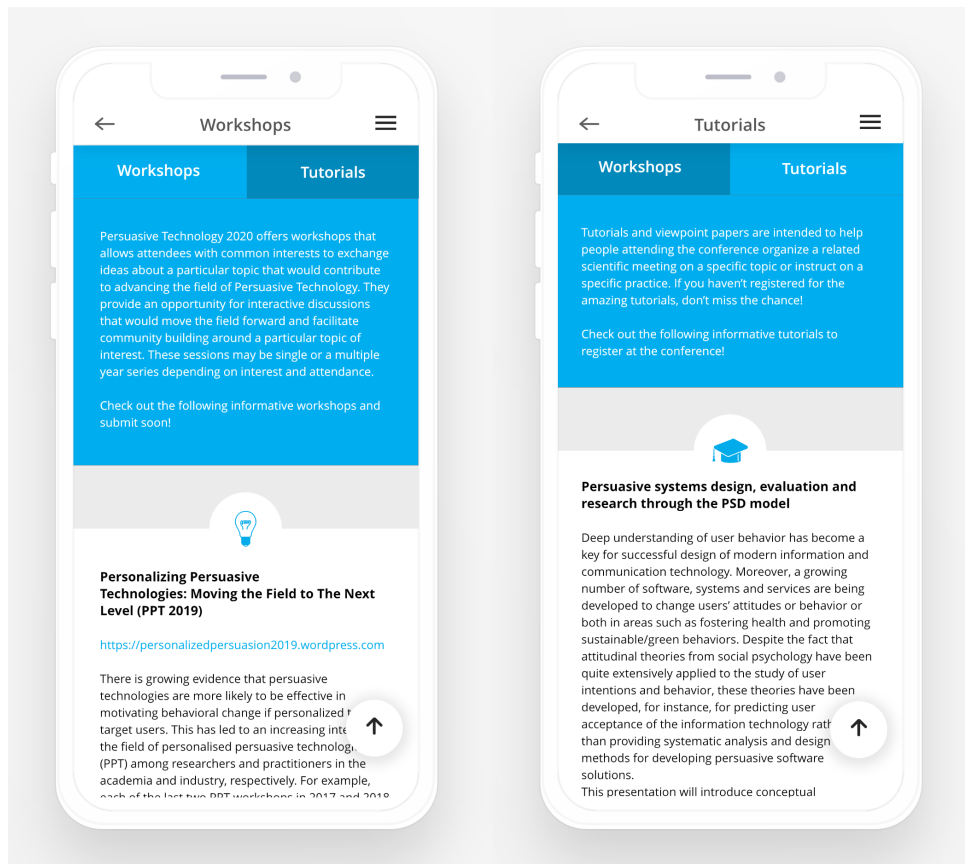
Figure 19. Mockups of Workshops & Tutorials pages.

The content was acquired from older website versions, since the research found that the latest version did not include description of purpose behind the two topics in their website. However, this type of information would be very valuable for new audiences, since they take more exploratory approach during interaction with the system, therefore including it was necessary. *Iconic labelling* can also be found above each of the content topics, where workshops include a light bulb icon, and tutorials are represented by a hat icon.

Another design requirement from *section 4.4.3* was the ability for the users to be able to operate with accelerators, where both heuristic evaluation and benchmarking methods found number of accelerators missing. Accelerators are the 7th heuristic principle *flexibility and efficiency of use* which allows for quicker interaction with the system through tailored action. One of those accelerators having a tremendous impact on the flexibility of the system is the *global navigation*, which could not be accessed in the old system, unless the user was located in the top section of the page. The solution in the new version was to design a "sticky" navigation bar, which would be available for the user to access from any location in the system *(Figure 20)*.
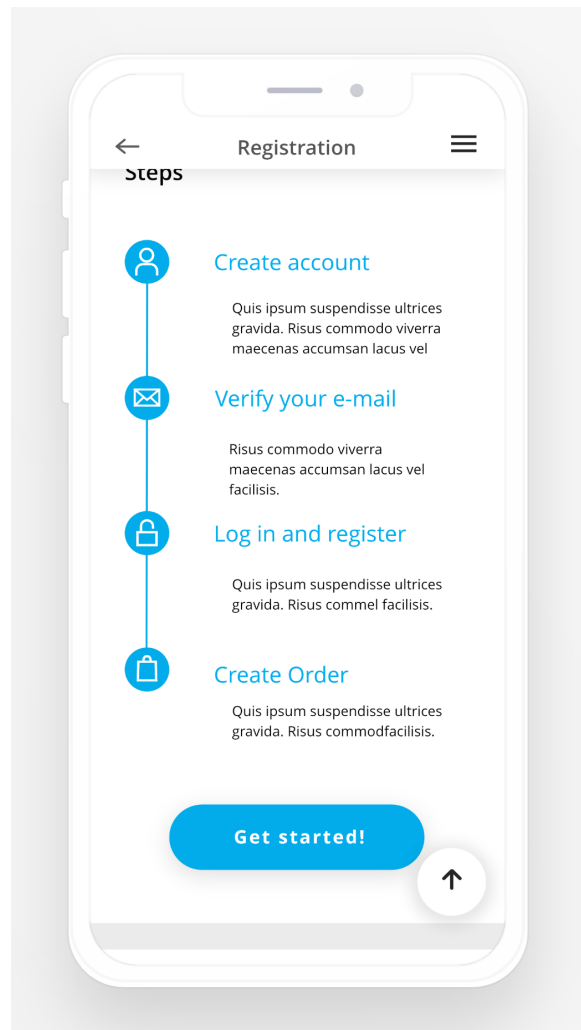
Figure 20. Registration page of the progressive web app.

Other accelerators included "go back", as well as "back-to-top" buttons. The system provided the possibility for users to go back to previous page quickly and efficiently, through the arrow icon located on the top left of the page. While in addition, back-to-top button located on the bottom right of the page, allows users to reach the top of the page without the need for them to swipe all the way up. Moreover, the Registration page is another example of the persuasive principle *tunneling*, in contrast of the homepage hyperlinks mentioned earlier in *5.2 Wireframes*. As can be seen on the figure above, the design is guiding the user through the process of registering for the conference, by providing an overview of the simple steps required to register.

The 7th design requirement was delivered by the mockup below *(Figure 21)*, which allows users to acquire additional information through the page "Frequently Asked Questions" or "FAQs". The mockup provided examples of these type of questions and used a filler text as description, in order to illustrate the expanding *local navigation* of the page.

Figure 21. Mockup of Frequently Asked Questions page.

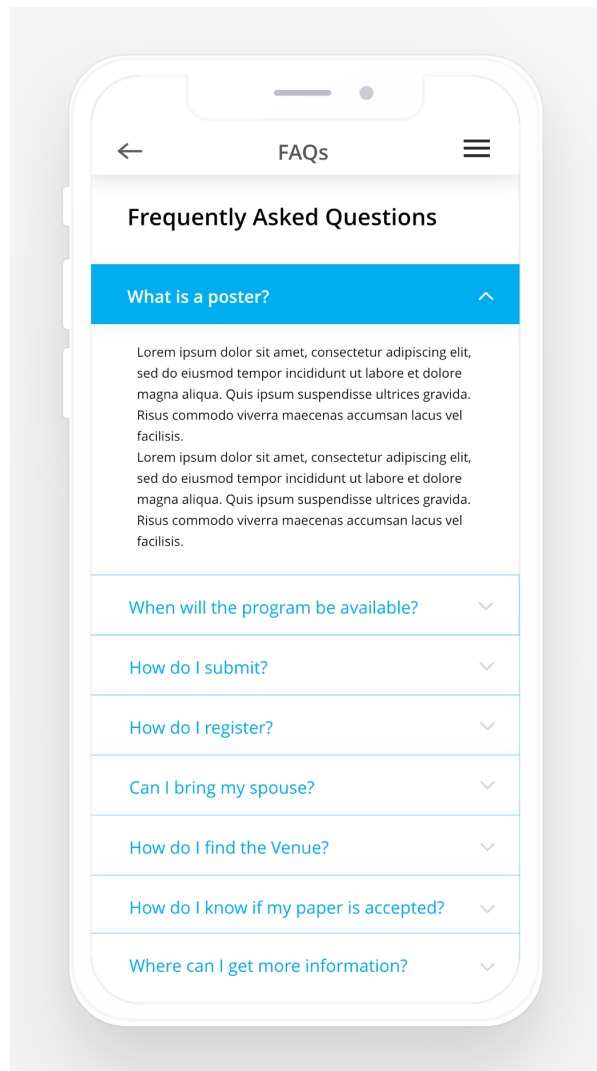The heuristic evaluation established that so far the previous website version did not include help or guidance for its users. The page illustrated by the mockup also considered the heuristic principle *Help and documentation*, which is particularly useful for new audiences, but also current members of the community. In either case, the FAQs page could save time and effort for both the system users and the conference organizers by anticipating questions which are asked frequently.

Finally the research meetings, survey and semi-structured interview concluded that users are open to receive additional information regarding the conference. The last design requirement consisted of the use of mobile notifications, which could notify the user about relevant information. Except for informing the users, notifications also provide the opportunity to inspire them to visit the conference event through prompts. This was one of the main reasons why the PWA was selected for the mobile platform, since unlike regular responsive website, PWAs enable users to benefit from notifications and see everything in their mobile browser, without the need to search and download a native app from Google, Windows or App stores. The implementation of this design requirement in the PWA would however require the approval of the users when they access the system. More about notifications will be discussed in the next section *5.4 The Kairos Factor*.

To summarize, the mockups were employed to visually demonstrate how the rest of the remaining design requirements have been applied in the new system. The demonstration included the application of bottom-up information architecture, where information in the PWA was separated into chunks, which made the pages easier to read through on the small screen. Moreover, the mockups visualized a more interactive interface, by including elements such as breadcrumbs, icons (iconic labelling), local navigations on pages with more content, as well as accelerators. All of which allow for quicker interaction with the system and enhanced usability. Finally, the sitemap structure, wireframes and mockups all provided the organization of content, which has been based on research findings on the user's needs and interests.

5.4 The Kairos Factor

This project considered timing and the persuasion context as crucial factors, which play a major role in the persuasion event. As previously stated, as a mode of persuasion, *Kairos* concerns itself with identification of the opportune moments for sending out the right messages in order to reach persuasion. On the other hand, persuasion context provided the persuasive intent and message, required to utilize *kairos*. To assist in achieving persuasion, except kairos and the outlined persuasion context, I have employed the Persuasive Systems Design model, which relies on principles of persuasion to effectively inspire users to carry out the intent. The way the method contributed was by applying the most relevant persuasive principles from the support categories, described in *section 3.6*, and implementing them in the identified opportune moments from the year wheel.

The research discovered that 83,33% of the survey participants would like to receive additional information regarding dates and deadlines related to the conference. Furthermore, the interview established that users might be inclined to receiving mobile notifications related to relevant information, such as updates of information, changes or cancellations. At the present time, kairos is represented by the research outcome in section *4.4.2* which illustrated a year wheel containing important intervals of time during the year, where certain information type is required from the system by its users. The identified starting points of certain information represent the opportune moments where elements of persuasion may come in, through the application of mobile notifications. In addition, the user interview also contributed with the formation of three phases (decision, planning and attending phase), which adjunct to the year wheel. The highest priority however falls on the decision phase, since this is the phase which determines whether or not the users perform the intent. And this is the phase where persuasion must step in the strongest, by appealing to the user interests and information needs.

As a start, the progressive web app requires the user to select whether or not they allow receiving of notifications, and notifications are the direct route to the user. The push notifications are basically messages from the system and they provide two types of communication about: information and tasks (Ganai, O. & Ledbetter, S., 2018). The prompts can only be employed if the users have voluntarily approved the notifications from the system when interacting with it. Unfortunately, often times interactive systems misuse push notifications, where they appear as *pushy*. They demand and tell users what to do, making them feel controlled or pushed to do something, which is what makes users turn them off (Ganai, O. et al., 2018). For this reason, the aim of the notifications in the PWA is to be

motivating for users, to guide them and help them achieve their goals. In order to accomplish this outcome and avoid coming as "pushy", the notifications need to be relevant, contextual and communicated at the right time. They provide a choice for the users to perform the behavior, rather than demand or insist. Furthermore, users who have approved notifications are hopeful. *"They are already motivated and want to be supported."* - Ganai, O. & Ledbetter, S. (2018). Therefore, being motivated, users need the facilitation to perform the behavior, where notifications are carefully considering relevance and time. *"The key to success of such technology applications is creating a decision point at or near the time when it's appropriate to take action"* - Fogg, B. J. (2003, p.44).

In order to ensure that relevant notifications are displayed to relevant users, the PWA would allow the user to select what type of information they are interested in while using the the system. This optional activity also took into consideration the persuasive principle *Surface Credibility*, which allows users to assess the credibility of the PWA based on initial use of the system (Oinas-Kukkonen, H. et al., 2009). The principle also provided the system with a more competent look and feel, by allowing users to select content of interest and aiming to supply only relevant information to them. Below *(Figure 22)* is an example of the optional selection of interesting information for the user, with the principle surface credibility.
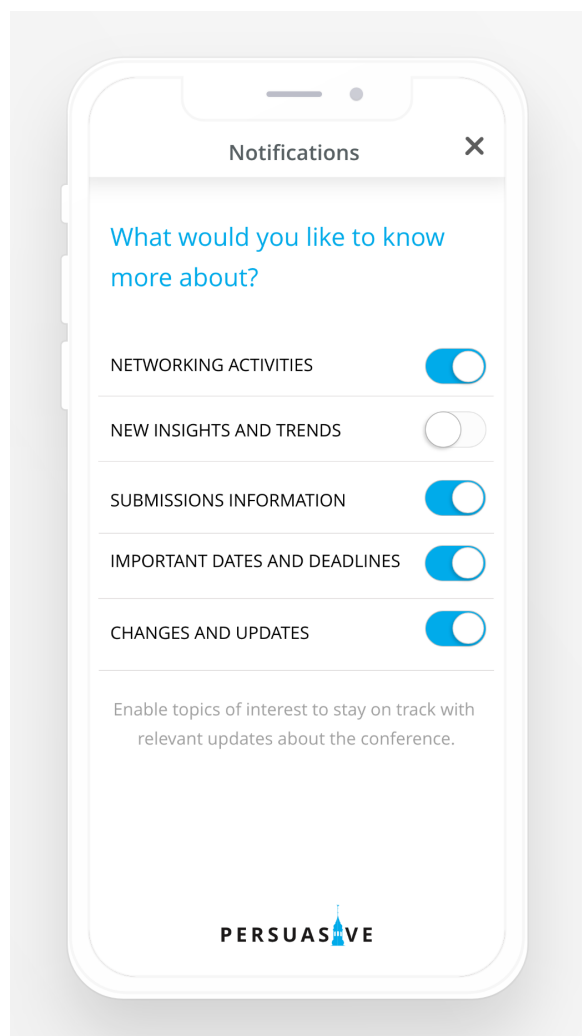

Figure 22. Mockup of Relevant Notifications selection.

In addition to the competent look and feel represented by the principle surface credibility, the PWA also provided *Trustworthiness* in a sense that the notifications aim at informing users of relevant information, related to the community and their practice. This means that the information is truthful and unbiased, making the system more reliable.

Based on the research outcomes, there are 4 types of information considered relevant for the target audience, which occurs during the decision phase:

- when users initially acquire general information from the system such as the conference theme, venue, location, potential workshops and tutorials to attend
- when authors are in the process of writing papers or other materials and information related to submissions also intervenes
- when the papers are being reviewed and a decision is expected
- and finally, the last moment for decision where users acquire more detailed/practical information

The following *(Figure 23)* demonstrates the Decision phase, which included also the Year Wheel processes, where the timing has previously been specified. Furthermore, persuasive principles extracted from the PSD Model are also illustrated. Only the principles seen as most suitable for delivering relevant notifications have been considered, since the notifications should not be too many, or they would cause inconvenience. Their purpose is to motivate and guide the users at the identified opportune moments, by reminding them of the target behavior and making the behavior simpler to accomplish.

Tailoring Reduction	Suggestion Social facilitation	Reminders Suggestion	Tailoring Simulation
General info	Writing process	Review process	Detailed info
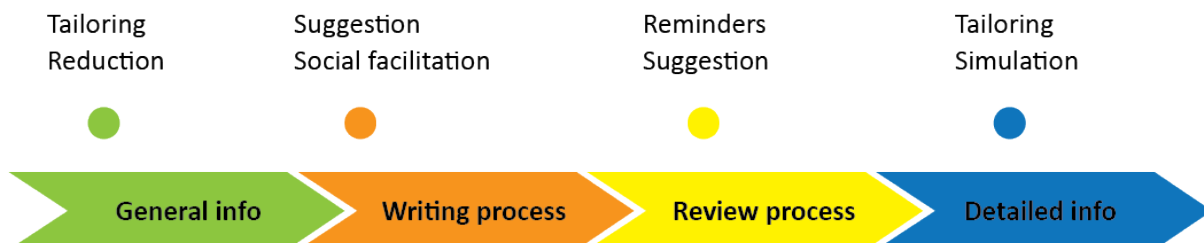
Figure 23. Decision phase and persuasive principles

General information

The persuasive principle *Tailoring* ensures that information provided by the system is tailored to the user interests and needs (Oinas-Kukkonen, H. et al., 2009). In this case, both quantitative and qualitative inquiry discovered that the user's main interest in the event revolves around getting new insights in their area of research, as well as networking with other people with similar interests. Therefore, *tailoring* can provide users interested in networking with prompts about special guests and social activities happening at the conference. In addition, the interview pointed that this would also appeal to newcomers or the ones attending the event alone. On the other hand, users who would like to get new insights in the field are prompted with information about interesting workshops and tutorials which would be presented on the upcoming conference.

At the same time, *Reduction* provides easing of complex behavior into simpler steps for carrying out the desired behavior (Oinas-Kukkonen, H. et al., 2009). The research discovered that some of the main information needs for users are regarding theme, information about program of the conference, deadlines for submissions, travel and accommodation related information. Thus, the persuasive principle *reduction* was employed to lead users to such information without the need for them to look for it in the system. Obviously not all of these topics are suitable for being a notification of their own. However, if the user has selected that they are interested in information regarding updates, dates and deadlines, then they will be notified when the new program of the conference days has been uploaded, or changes of submission deadline have been made for instance.

Writing process

This process involves the writing or preparing of different materials for submission. Therefore, this stage is also the one that has to be the least "invasive" since some users would be concentrated on working. However, including the persuasive principle *Suggestion* in the beginning of the process can actually prompt more users to think about participating in the conference. *Suggestion* is concerned with providing suitable recommendations, which also increases the persuasive power of the system (Oinas-Kukkonen, H. et al., 2009). Moreover, by adding the principle *Social facilitation* to this notification message, the system increases the likelihood of persuasion, by outlining that other users are performing this process (or behavior) as well (Oinas-Kukkonen, H. et al., 2009). Therefore, the system suggests the user to participate, by also pointing out that that other people are on the same track, without being invasive and pushy, but rather encouraging and motivational.

Review process

This is the stage when users, who have submitted their materials, expect the news about whether their papers have been accepted. The system informs the users when the reviewing process has ended. The principle *Reminders* is utilized for reminding users of their target behavior (Oinas-Kukkonen, H. et al., 2009). Furthermore, the principle *Suggestion* was employed in combination with *reminders* to empower and further motivate authors to attend the conference, in case their paper has been rejected. Rejected papers are a reason for not attending the conference. However, the research found that rejected papers could be submitted as "posters", which would suggest authors to take the opportunity and still come and present their ideas on the conference. This information was also missing from the current system, however it was employed as notifications and used as additional motivation for users to attend the event.

Detailed/practical information

During this stage users acquire more detailed information about the conference event, and while capturing the "planning" stage from the user interview, it is also considered the last possibility for persuading users to attend. As a result, the persuasive principles *Tailoring* and *Simulation* can be employed to inspire users by appealing to their interests and also providing them with the vision of the outcome and what the event might bring them. Both the interview and the survey discovered the main interests in attending the conference for the user group. With this in mind, the notification motivates the user with a message about obtaining knowledge regarding the newest trends within the field, or seizing the networking opportunities they look for at the social activities of the event.

Of course notifications informing about important changes in the program, dates or locations, and similar information would also be included in the notification process, since this type of information is considered highly relevant as pointed out in the semi-structured interview. This is also the case in the *Attending phase (section 4.3.3)* where users are already at or near the time of the conference event. In fact, one of the things that the interviewed user shared being part of the organizing committee for a different conference, was that it would have been nice to have a direct way to contact the attendees when there have been last moment program changes or cancellations. And notifications can be quite practical in this situation for users of the system.

As can be seen, this section exemplified the way Kairos is utilized through the integration of PSD principles into the identified opportune moments for persuasion from the year wheel activities of users. With consideration to the persuasive context, the applied persuasive principles increase the chances that users will perform the target behavior, and namely, attend the conference event. This is also achieved by providing relevant and timely notifications to the user. At the same time the notifications enhance the interactivity between the system and the user, increase the persuasive power of the system, and provide means to keep members engaged throughout the year.

6. Reflections

The evaluation methods in the research stage were extremely valuable for building context and understanding of content types in the previous conference websites of the Persuasive Technologies community. Nevertheless, access to data visualizing the number of conference attendees for the past three conferences could have given additional valuable insights. This data could measure the different variables and determine the most successful and informative websites. Furthermore, provided that the last website version supported website analytics, access to website usage (such as Google Analytics) would have supplied the research with insights into content performance, visitor information, analytics of sessions and time of visiting the platform, which could also improve the accuracy of the year wheel timing information. Nevertheless, involving the actual users of the system helped in discovering much of the needed facts regarding usage, information needs and timing.

I have performed the heuristic evaluation method individually, although it usually involves more than one expert, which could potentially locate more or different design issues in the system and lead to additional outcomes (Wilson, C., 2014). Furthermore, heuristic evaluation came short in area where knowledge of the context and content of the system discovered a problem. Certain information addressing new audiences was missing from the current system, and this issue was detected through utilizing the method benchmarking. The heuristic evaluation would not discover such issue unless there was already existing knowledge of that information.

A further step would be to add the Search component to the design, as some users especially the ones who are members, could use the search bar to locate the information they need, rather than having to browse for it. It was stated in the card-sorting that the users already knew the process for submission, but if they needed to recall small details about it, search could be quite practical for the more experienced users.

Time-wise it was extremely useful to employ wireframes as a starting process of the design stage, since it allowed the creation of ideas while also saving time when changes were required. The mockups added the actual look and feel, however they did not include interactivity. Therefore, the PWA was also turned into high fidelity interactive prototype within the program Adobe Experience Design. A typical form of high fidelity are the digital prototypes, which include high level of interactivity, design details, and effects (Babich, N. 2017). The program allowed the converting of mockups into interactive prototype, which behaved like the real product without the need of coding. This way the prototype became highly functional, simulating almost all of the capabilities, which the final product provides.

The high fidelity prototype was prepared for testing the built information hierarchy structure of the progressive web app and how intuitive the navigation paths were. The prototype can also validate the usability and the design of the product. The actual testing has not been performed in the timeline of this project, since the main focus has been combining the two knowledge fields and exploring their mutual benefits. However, the prototype is available as a further step towards the *Implementation* phase of the information architecture process outlined in section *2.2 Process Overview*, where the design would require testing before launching the system.

7. Conclusion

This project looked closely at the way two knowledge fields work together, by employing them in the process of evaluating existing systems and developing a new one. The process included three phases *research*, *strategy* and *design*. The *research phase* analyzed the context, content and users of a system by employing quantitative and qualitative methods. This was achieved by evaluating the current content and structure of the information environment, and identifying successful and unsuccessful characteristics from the systems. The research also explored the user interests, viewpoints, behaviors and experiences with the system, which led to creating a structure for content according to their needs. This led to the *strategy phase*, where strategical design requirements were generated based on the research outcomes. As part of the strategy was also considered the persuasion context used during the research phase, serving as guidance towards effective persuasion. Finally, the *design phase* developed from low-to high fidelity designs, in order to demonstrate how all the design requirements have been implemented in the new system, as well as the way the IA and PD fields mutually benefit the process. The project concluded by exemplifying how the system can keep users engaged and increase persuasion throughout the course of a year, based on identified opportune moments for persuasion.

As described in the introduction my research process has been driven by a more distinct focus on exploring the following question.

- How can Information Architecture and Persuasive design be combined and what are the mutual benefits in theory as well as in practice when designing interactive systems?

The following paragraphs contribute to the clarification of how the mutual benefit of the two knowledge fields has been seen in theory, method and practice in this project.

1. **How do PD and IA facilitate each other in theory?**

Information architecture has been the basis which was used in the planning and design of the new system. It provided a structured process and an approach to understanding the context, content and users of the system, while also utilizing the components needed for organization and structuring of information. In addition, the field provided the ability for creation of navigational paths and labelling of content, which enhanced the usability of the system and findability of information for the user.

On the other hand, persuasive design takes over where information architecture stops. When there is a need to reach the users and motivate them to take an action, well structured and easily accessed information is not enough. Persuasive design is what prompts people to take an action. While IA provided ground for the development and structuring of the new information environment, it stayed in the digital realm of the system and lacked reach in the physical realm of users. Persuasive design took it a step further, by bridging the two realms and providing a direct route to the users with the assistance of the PWA technology. Furthermore, it also utilized principles of persuasion, which facilitate the users to

perform the target behavior. In addition, PD made use of *kairos* within the persuasion context, which identified the appropriate time for taking an action to effectively persuade users. And this is where the system moved from informative to also being influential.

2.   How do the two fields facilitate each other in method?

Both knowledge fields provided the project with practical methods, which complemented the process. For instance, the different methods employed for understanding the background and circumstances ensured nuanced insights regarding the intended context. This was where the context of information ecology was mixed in with the persuasion context from the Persuasive Systems Design model and both elements were integrated in the context analysis of the project.

Information architecture explored the context by looking at the community goals, motives, historical background information, system, aiming for understanding the environment and their technological needs. Whereas, persuasive design had a different look- analyzing the *persuasion context*, which brought in the interpretation of who the persuader was, their intent, intended audience (persuadee), persuasive message, technology context and strategy on how the message would be transmitted. Therefore, both fields mutually contributed with two different perspectives on the context, both understanding the community, their values, their processes and the mission, however also the persuasiveness of the system, the intention behind it and the plan to effectively persuade users of the system. This resulted in a broader and more nuanced understanding of the context.

3.   How do they facilitate each other in practice?

The developed PWA prototype represents a grey area of overlaps between IA and PD. For instance, the *navigation* component representing the navigational paths and hierarchy of IA guides the user through an experience, just like the persuasive principle *tunneling* does. The same way content is carefully selected in IA based on the user interests and needs, the principle of persuasion *tailoring* also provides appealing information to the user groups of the system. IA addressed the usability of the system, while PD also carried the persuasive intent of the system. However, an extra layer was added to the system when the PD field utilized the persuasion context, *kairos* and the PSD model, allowing for prompting users to act towards the intended behavior. And the mutual benefit in practice is more clearly expressed in the notifications of the PWA, where the layer of persuasion was included.

A condition for these three mutual benefits is that designers are working on platforms, which allow the potential of persuasive technologies to be reached, such as the case is with PWAs.

The project not only resolved the case, but also contributed to the IA and PD fields with the following findings:
- IA stays in the digital realm of systems, while PD bridges the digital and physical realms, allowing the technology to reach and prompt the users to take an action.
- The context can be looked at from different angles, where combining IA and PD methods for context analysis provides broader and more nuanced insights into the research.

- Both IA and PD overlap where principles of persuasion can be found within IA elements and conversely. However, IA aims at easing the usability for users, while PD applies principles with an intent to persuade people to carry out a behavior.
- Except in a design interface, principles of persuasion can be applied also in identified opportune moments, in order to enhance the possibility for users to perform the target behavior.

Given these points, information architecture contributes with the basis and structure of the system, holding the information environment together, while persuasive design contributes with an extension to the physical realm of the user and the opportunity to influence them. As *The Cross-field* section pointed out, very little research has looked into combining the two fields, and none of them in practice. Exploring these points even further could be a recommendation for future research, and an argument regarding why it may be beneficial to explore the relation between IA and PD even further.

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Appendix 1: Heuristic Evaluation

The following table has been created to illustrate the missing heuristic principles from the different conference websites for the past three years. The missing principles have been marked and discussed in the following paragraphs.

Heuristic Principles	2017	2018	2019
1. Visibility of system status	X		
2. Match between system and the real world			
3. User control and freedom			
4. Consistency and standards	X		
5. Error prevention		X	
6. Recognition rather than recall			
7. Flexibility and efficiency of use			
8. Aesthetic and minimalist design			
9. Help users recognize, diagnose, and recover from errors		X	
10. Help and documentation			

Heuristic evaluation of Persuasive Technologies
conference websites for the past 3 years

When looking at the global navigation of the website version from 2017 (Appendix A) there was no indication of current location on the platform, when selecting pages to browse. Instead, the indication could be found in the upper middle of the page in the form of a big headline, however the indication of location is missing when going deeper into the hierarchy. The heuristic principle *Visibility of system status* is aimed at keeping the users informed of where they are by providing relevant feedback to the users (Nielsen, J. & Mack, R. L., 1994). Alternatively, the global navigation could use colored text or graphic element as an indicator the selected category of the navigation bar and combine it with small breadcrumbs to retrace the steps taken, for the purpose of indicating more specifically where the users are located. *Consistency and standards* would be employed for preventing users from confusion (Nielsen, J. et al., 1994). However the platform has valuable information such as "conference theme" hidden under the label "more information" within the top category of the global navigation "program", which could be a confusing place to look for the theme of the conference. Finally, looking through the lenses of someone who is not part of the PT community, there is very little information (deeper in the hierarchy) about what the event stands for.

The website version of 2018 (Appendix B) appeared to rely heavily on images and graphic elements. However, in cases where the network connection is not fast enough, the website could be difficult to navigate through. *Error prevention* would focus on eliminating errors in the platform, however, when it comes to the global navigation menu, the last button "contact" could be found misplaced under the menu bar, which indicated an error, making the button invisible on certain places. The principle *Help users recognize, diagnose, and recover from errors* would provide visual feedback for users of the platform in an error state (Nielsen, J. et al., 1994). Another error was noticed in the section "For authors" from the global navigation, which on-click would lead to an empty page. That could be altered by helping users recognize the error and suggesting actions to recover. Lastly, even though the platform included breadcrumbs indicators, it was noted that some of the pages displayed more breadcrumbs than necessary leading towards non-existent pages.
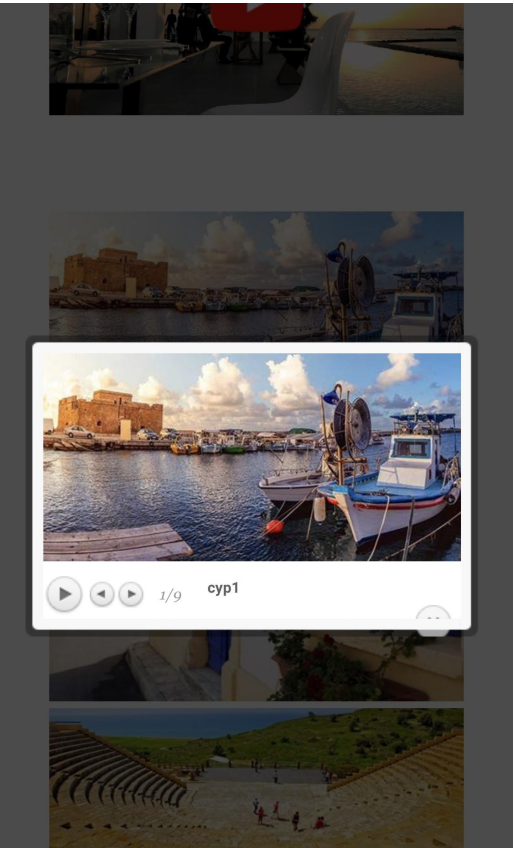
The latest version of 2019 had considered the past mistakes on computer platform.

Appendix 2: Screenshot of mobile platform

A: Global navigation menu of Persuasive 2019 mobile website.
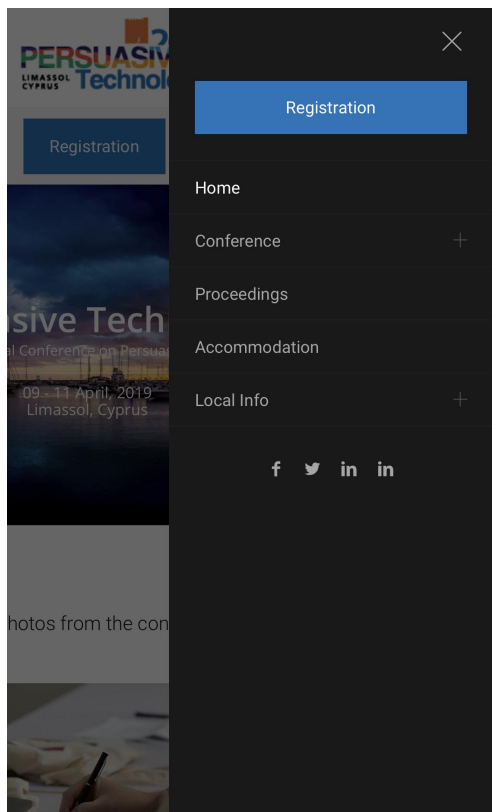
B: "Close" Image icon

Appendix 3: Screenshots of mobile platform

Only two of the three columns of information was visible on those pages and they could not be zoomed out or moved to the left in order to see the rest of the tables.

A: Program information

Tuesday 09 April, 2019

08:00	Registration	
09:00 – 11:00	Workshop: Personalizing Persuasive Technologies(PPT 2019) : Personalization for Wellbeing Meeting Room: Athena	Workshop: The 19th Workshop on Computational Models of Natural Argument (CMNA19): The Role(s) of Argumentation in Persuasion Meeting Room: Apollo
11:00 – 11:30	Coffee Break	
11:30 – 13:00	Workshop: Personalizing Persuasive Technologies(PPT 2019) : Personalization for Wellbeing Meeting Room: Athena	Workshop: The 19th Workshop on Computational Models of Natural Argument (CMNA19): The Role(s) of Argumentation in Persuasion Meeting Room: Apollo

B: Fee information

Registration Fees

|	Early Registration Up to 11 Mar, 2019	Regular Registration 12 – 26 Mar, 2019	Re Fi
Normal Registration (Conference only)	€ 430.00	€ 500.00	
Normal Registration (Conference, Workshops, Tutorials)	€ 550.00	€ 620.00	
Student Registration (Conference only) *	€ 300.00	€ 350.00	
Student Registration (Conference , Workshops, Tutorials) *	€ 420.00	€ 470.00	
Workshops and Tutorials Fees	€ 180.00	€ 240.00	

Appendix 4: Content Inventory

Content inventory of Persuasive Technologies 2019 website, containing all of the pages of the system.

	A	B Navigation title	C Page title	D Files	E Comments
2	0.0	Home	Persuasive 2019		Information about Notes (Important information), Key Deadlines, Organizers, Sponsors, About Cyprus, Social Feed & Social Media links
3	1.0	Conference			No page at this level
4	1.1	Venue	Venue		
5	1.2	Programme	Programme		No program available yet
6	1.3	Workshops and Tutorials	Workshops-Tutorials		No "Overview" informing the user what the page is about
7	1.4	Committees	Committees		
8	1.5	Social Events	Social-events	3 PDF Files	3 PDF Files with information about excursions
9	2.0	Call for Papers			
10		Paper Submission	conf=persuasive19		Easychair Conferences link
11		Publications	computer-science		
12	3.0	Accommodation			
13	3.1	Atlantica Miramare – 4* (Venue)	accommodation-2		
14	3.2	Curium Palace Hotel – 4*	accommodation-2		
15	3.3	Harmony Bay Hotel – 3*	accommodation-2		
16	4.0	Local Info			No page at this level
17	4.1	Travel			
18	4.2	About Limassol			
19	4.3	About Cyprus			
20		Booking	register		
21	5.0	Registration	Registration		
22		Easyconferences Registration	Easyconferences Link		External link
23	6.0	Contact	committees		Contact the Organizers
24			Administrative Support		Email address & phone number of Easy Conferences

Appendix 5: Online Survey Results

A: Donut chart of website users

Very often
16.67% (1)

Not so often
50.00% (3)

Somewhat often
33.33% (2)
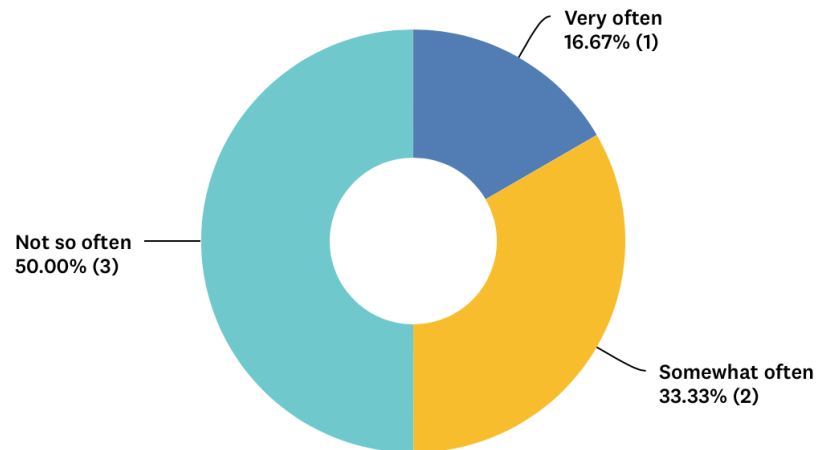
Donut chart displaying frequency of use
of the conference website according to users.

B: Why do you use the persuasive conference website?

P. 1 To get schedules, conference info, travel

P. 2 Check out venue, dates et

P. 3 When I need to see the details of an up-coming conference (such as exact time, where it is/how to get there, possibly contact details to one or more chairs -- this depends on my role each year, if I'm organising something, presenting something, or just visiting). Registration and hotel recommendations are another reason.

P. 4 To check the program/schedule, select a hotel

P. 5 to check critical dates

P. 6 I am a regular attendee of the conference and visit it to stay updated on deadlines, programs, venues and everything else related to the conference.

C: Was there any kind of information, which was missing or difficult to find throughout the year?

P. 1 nothing comes to mind

P. 2 Don't know

P. 3 Not really.

P. 4 The last time I checked, about two weeks ago, there was no program-related information to be found.

P. 5 In what dates certain events take place

P. 6 It differs. I usually find all the information I need, but most of the stuff about submission and reviews I already know as I have done it before. I usually spend time browsing google to learn more about the host city, and how to get around and so on.

**D: Categorizing participant responses from the survey: What makes the conference interesting?**

	Open-ended question 1				
2	**What makes the Persuasive Technology conferences interesting for you?**	Area of research/Ideas for research	New trends, new insights	Networking, keeping in touch with the community	Persuasive Technology/Overall topic
3	Total respondents who answered X	4	3	3	1
4	% of respondents who answered X	33%	25%	25%	8%
5	Learning new trends, seeing state of the art, meeting colleagues		1	1	
6	AreA of research, keep up	1	1		
7	This is the one conference that focuses on my specific research area at the moment.	1			
8	I hope to come back with ideas for research as well as teaching, keep in touch with the community	1		1	
9	overall topic				1
10	Persuasive technology is one of my main research areas, so for me, it is the place where I get to explore all the newest insights. It is also a very important community for networking. Many of the regular researchers are people that I have known for many years now, but this is the only time every year we get to sit down together and catch up on things.	1	1	1	

E: User preference to receive additional information

Overall, 83,33% of users would like to receive additional information about conference dates or deadlines. 50% would rather receive emails, 33% chose mobile notification/e-mail, while 16,67% do not need that information.

How would you prefer to receive additional information about conference dates/deadlines?

Answered: 6   Skipped: 0
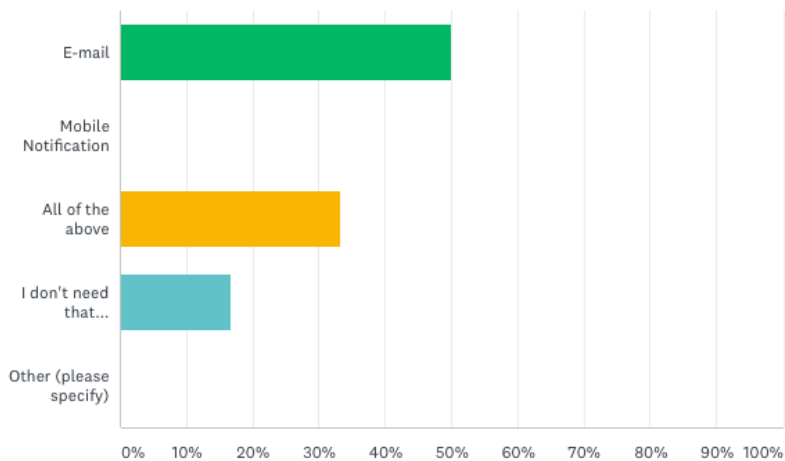
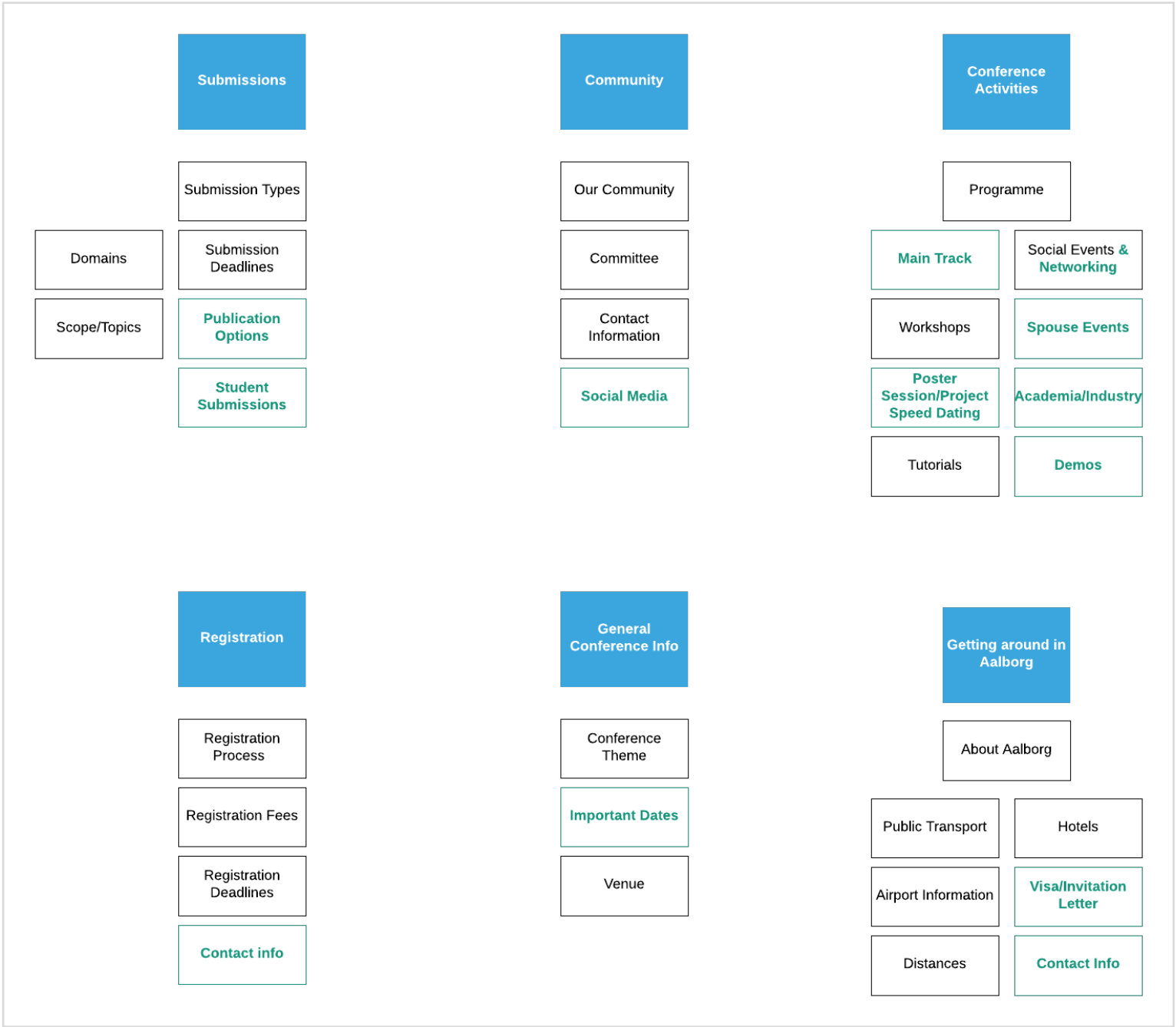| ANSWER CHOICES		RESPONSES	
E-mail		50.00%	3
Mobile Notification		0.00%	0
All of the above		33.33%	2
I don't need that information		16.67%	1
Other (please specify)	Responses	0.00%	0

Appendix 6: Card-sorting

The following image represents the digitally recreated outcome of the Card-sorting method. The participants were asked to think of the sorting as grouping similar content together, rather than thinking how the website should be structured.

Submissions
- Submission Types
- Domains
- Submission Deadlines
- Scope/Topics
- Publication Options
- Student Submissions

Community
- Our Community
- Committee
- Contact Information
- Social Media

Conference Activities
- Programme
- Main Track
- Social Events & Networking
- Workshops
- Spouse Events
- Poster Session/Project Speed Dating
- Academia/Industry
- Tutorials
- Demos

Registration
- Registration Process
- Registration Fees
- Registration Deadlines
- Contact info

General Conference Info
- Conference Theme
- Important Dates
- Venue

Getting around in Aalborg
- About Aalborg
- Public Transport
- Hotels
- Airport Information
- Visa/Invitation Letter
- Distances
- Contact Info

Appendix 7: Semi-structured interview transcription

I= Interviewer
P= Participant

1. **What is your role in the conference?**
   - **P:** …Right now mostly just a participant (I think). Yes.

2. How often do you attend PT conferences?

   - **P:** I've been twice, I think. I'm just thinking…
   - **I:** So when was the last time?
   - **P:** The last time was in Austria? It's been a while because I've kind of moved in a different direction…
   - **I:** Mhm…
   - **P:** …in my research so… I've been to the one in Copenhagen and the one in Austria.
   - **I:** That was how long time ago?
   - **P:** I'll have to look that up actually… It's been a while.
   - **I:** And you said you've been there for research purpose?
   - **P:** Yes. Uh, I was there as, both times, as a master student at Persuasive design master's program. And that was in Copenhagen. And in the second I was a Phd student.
   - **I:** Okay.

3. Could you mention one or more criteria that motivated you to go to these conferences? Maybe for example the last one?

   - **P:** Um, well, I mean, for me it was natural to go there because I was doing master program in Persuasive design and this is sort of the main conference for that, and it's also in, I mean the people who were involved at that program of the time were also involved in, sort of, building up that community.
   - **I:** Yes.
   - **P:** So in the beginning that was my main motivation to go there, was sort of the community, to be part of that. And then the last time I was there to publish… I mean I was there to publish my research and to meet people from potential, also finding potential Phd…
   - **I:** Like collaboration?
   - **P:** Well yes collaboration, but also in my Phd defense … So I was also there to sort of, I mean, meet the people who are working specifically with a specific topic for persuasive design, which is few people. So they were there. It's very much the community thing, and of course publishing.
   - **I:** Yeah. So the first time you went more for introduction to the field or?

- **P:** Yes. I think the first time I think I was in my… My second year of my master so it was sort of in the end of my master.
- **I:** Okay.

4. Could you come up with a criteria for not attending the conference?

- **P:** Yes, I mean, umm, for me I guess that's very individual, but for me it's also about distance. So it does move around a bit and sometimes it's in the US and uh I have to prioritize where to go because of funding and stuff.
- **I:** Yes.
- **P:** So I would prioritize going to the ones that are closer.

5. What do you like about the conference the most? And the least about the conference?

- **P:** I like that it's a one track conference actually. That you get to see everyone in the field and it's a small conference, in comparison to many of the bigger ones. Umm, and I like that it's very diverse, in terms of domains, but that we all speak sort of the same language in a way.
- **I:** Mhm…
- **P:** If you go to (other conferences) conferences it's very very diverse and you will have people who barely understand each other.
- **I:** Okay.
- **P:** Ah, and you won't really see that in a persuasive design conference because there will be like terms and understandings that we share and have in common and also in many cases sort of values associated with that. Which we share, so it's a small community and more like, I don't know, close in a way community, um, not that I know everyone at all, but we have sort of a shared understanding of the field. Um, so that's a nice thing about the conference.

6. Where do you look for information about the conference?

- **P:** I would probably go on the website for information, that would be the main go-to place.
- **I:** No emails or anything like that?
- **P:** Um, I don't think I am subscribing to any mailing lists.. I will just look up the information online. But of course in this case if it's here then I will also know people here who would probably encourage me to look for more information or maybe tell me about it so..
- **I:** Okay, so that's the main source?
- **P:** Right now it is.
- **I:** Because the websites change every time, and you have to type in a different way, because it's different years every time.
- **P:** Yeah, it's not one place, I would google it actually. I think I've looked it up last time, because *someone* was going and I think I was looking for information about the theme and stuff, and I was just googling persuasive design 2019 so…

I: Okay, so a little bit about the website…

7. In the year that you attended the conference, how often were you visiting the conference website? *It doesn't have to be exact number of course, but was it very often or was it rarely or…?*

- **P:** I think it varies, depending on when in relation to the conference. So around submission of the abstract of papers….
- **I:** After the summer?
- **P:** Around the time when submissions are, usually the early fall. For a conference that is very like usually the same dates, you don't have to check up on everything very early on, so yeah some time around summer and fall.
- **I:** So that's when you visit the most often the website or?
- **P:** Then.. yeah, and then um once you know that your paper is accepted, then to see the program and scheduling and planning and stuff. So, before submission and after acceptance of paper and, of course, around the time you're going. But when you get your paper accepted that should be when you book flights and stuff. So then you need all that practical information about where it is and yeah…
- **I:** So how would you categorize it, do you visit it often or not so often considering what you just mentioned?
- **P:** Often, for a very short time (laughs).

8. What tasks do you most often do on their website?

- **I:** You already mentioned something about booking?
- **P:** Yes, so before submission of course it's about like looking up the themes and potential workshops… Also if there's something you wanted to submit something for… And also I mean the venue does mean something… Then I would also look where it is…
- **I:** So why would you consider the venue as (something important)?
- **P:** Um, well it's I think it was down to funding actually. If you are a phd student you have a limited amount of funding and then you need to sort of plan more ahead than if you had unlimited funding I guess so…
- **I:** Yes…
- **P:** So if I… um… get a paper accepted here, will I get points, will it be accepted… you know… that's sort of the things you would consider as a phd student I think in many cases.
- **I:** Okay.
- **P:** And that would be before you start even thinking about submitting. Because otherwise you would send it somewhere else… Um, so yeah I think that would be some of the things I would look for before submitting. And then after acceptance it's more about seeing, sort of, when is my, ummm, talk in the schedule and when do I want to be there for the full conference and also the workshops and so on…
- **I:** So where do you see that information, for example when you are supposed to talk? Because the website doesn't really show that information, except when the program comes out. It's kind of in the last moment.
- **P:** Yes, I wouldn't know. But usually say if there's like a doctoral consortium before or if there is workshops…
- **I:** Okay, yes.

- **P:** So you would see when is the main program. When I go for workshops, are there any workshops that are relevant for me and then plan according to that. And then of course if it's summer where you plan to do some sightseeing as well, can I spend an extra day that will also be about that time and… consider that.
- **I:** Yeah, so is there anything that.. back to the same question… the tasks that you do most often. When the actual event comes, do you also visit it then (the website)?
- **P:** Yeah, I do. Um, but mostly to see the programming details and plan the individual days. And maybe also I mean if there's any activity going on I would also go there to sort of plan ahead maybe if I needed to, if there is someone I wanted to get in touch before the conference I could see if there is workshop or something…

9. Was there any information missing or difficult to find? If you could remember…

- **P:** Hmm, it's been a while (laughs)
- **I:** If anything made a lasting impression…
- **P:** Yeah, I can remember from Copenhagen. There was a thing about some of the program being at different locations. I think some was in the library and some was…
- **I:** Oh, so physical?
- **P:** Yeah, physical location. That was very difficult actually, to find out how to get to that other place. And how to get around there and so on. So I remember that, still, that that was difficult. Also when getting there… I can't remember…

I: Have you checked the current website or?
P: I actually haven't…
~~10. If you could change one thing about the current system or add one thing, what would it be?~~

I: Now I'm going to go towards the questions about mobile platform.
11. Have you ever accessed the website through your mobile device?

- **P:** Yes.
- **I:** Could you tell me what was the case? (**12. Could you tell me more about your experience with it**)
- **P:** That was back… I mean…
- **I:** Let's say… why did you access it through your mobile and not through your computer?
- **P:** I think that was because I was there at the conference. Um, and in the hotel, and like wi-fi was easier on the phone… So that was, I mean, that's usually my main platform when I'm traveling, because it's so much easier except if I'm working. Sitting and working, then of course I'm using my laptop, but if just checking for information I usually do it on the phone.
- **I:** Okay.

~~13. Under what circumstances would you normally access the website through your mobile phone?~~

14. Let's say that you have an application what would make you use it?

- **P:** Um, I mean, of course the easy access would be important. That I could access information very quickly and I wouldn't have to… like if it's an app I guess I would know that I have it installed and it's the right information and I'm on the right page and so on… and not some random page. And I think I would use it mostly during or just close to the conference and not… I don't know, depends on different um, whatever functions it has…
- **I:** Mhm…
- **P:** …but usually when I use apps for conferences it's when I'm there. So to plan or to find locations or something like that.

15. According to you, what qualities must the app have to be good?

- **P:** Obviously for persuasive design conference, I guess, you expect some sort of umm, well functioning design that is well thought through and that will have all these features that you usually expect from something that is supposed to be umm, useful (laughs). I don't think necessarily that the aesthetics are very important, I mean it's fine, but not on, like… the main functionalities have to be there, that's the main thing. And then aesthetics for me it's second. So if it looks really nice but it does not work, then I will not use it at all. So functionalities over aesthetics for sure.

16. What is the most important feature you think the app should have? Why do you think this is the most important?

- **P:** I think it would be really nice if it was very easy to see the exact locations of each talk. Because that's something that is, I mean with the program you have to scroll through the program to find or look up paper or whatever.. and find the locations, that would be very annoying. And also if it's a place where it can be a little bit difficult to find your way and map of sorts… could be really nice. Something that helps you navigate when you're at the conference I think is the main thing that I would use it for.
- **I:** So what about submissions for example or back before the actual event?
- **P:** It would be nice of course to see your status or something. When do we expect to have your review ready or if you had something you need to review yourself, if that's a part of it. Um, it would be nice to access this but I still think that in many cases if I was reviewing, I would do that on my laptop. So I would already be on my laptop for that specific purpose. So it's more like for a quick information about… Is it accepted or not, would be nice to see if… But I mean I would also expect to get some sort of e-mail notification I think, when is the reviews ready or…
- **I:** Would you think it would be easier to get all that information on your phone (app notification) instead of your email? I mean let's say something is done, the reviews are done or starting… Would you think that would be more useful or…?
- **P:** I think there is definitely some generation gaps there, that for my generation I would expect to get an email. I think I would be quite upset actually for instance I was assigned papers to review and I would not get any email about it. And I only got an app notification. I'm still struggling with checking notifications.. When I get notifications I tend to ignore it. Unless it's something like… I'm already in a conversation and there's notification okay then … So if it's just a random notification from youtube or something I don't go to check what it is. So I have apps notifications that are just

sitting there, and that's why I could maybe overlook this. Unless I know that there is something important coming. But I think I would be, at least for me and people who are older, I think I would expect some sort of an e-mail notification as well, in addition maybe to a notification on the app.

17. How do you think an app could be helpful for the persuasive technologies community?

- **P:** Mmmm. I mean I've tried a few apps now for conferences. And I really like the fact that you can make your individual schedule for your day. Because that is something that you spend quite a lot of time doing manually before. Like on paper or whatever. I usually put it in my outlook calendar like from 10 to 11 I have to do this talk and then I have remember to go to this and so on. So that would be nice to just sort of do that in a more intuitive way. So I think that would be the main thing. I know that some apps support some sort of community within the app, I haven't really seen it work yet. I did use it like for the last conference I was at, they used an app for the conference. And I did introduce myself on there as we were encouraged to do, but I didn't, I mean, some people did and no-one used it. It was not something we used. Whereas, I did use the scheduling a lot and the planning to see when are the busses leaving and stuff like that, it was very nice to have. Yeah, so I mean in theory the community part could be nice, but I think it has to be really thought through, otherwise it's just annoying that you get all these notifications "please introduce yourself" and nothing happens. Someone needs to sort of facilitate it in a way I think…

18. Would you consider notifications as a useful tool for the community? Why?

- **P:** On the app? Or in general? Yeah I mean…
- **I:** If for example you're able to select what you're interested in. Because I know that there are different groups.. some are going there for research, others are going there for collaborations for projects or something so if you were able to select your interests..? Would you consider them as a useful tool?
- **P:** Maybe. Umm, I am just trying to think of.. I mean I would like if there was some sort of direct communication in the app I would like a notification if someone had contacted me. But if its more general information I am not sure I would actually… I would probably turn it off… If it's just like these people.. Because I agree a lot of people are going there for different reasons, but I think they also know who they're going to talk to already or where they're going in terms of what types of activities. So unless you could, I mean maybe for newcomers it could be nice to have some sort of like, announcement of activities or… invitations in a way like if you want to join… I think someone actually did that on the last conference, go somewhere with people if you're new.
- **I:** On the platform or?
- **P:** No, it was a different conference, I think on the app I got a notification about newcomers.
- **I:** Mhm. So what kind of notification was it?
- **P:** Mmm, I can't remember. I mean you can see I have 223 notifications…
- **I:** This is notifications or…?
- **P:** I mean for me this is a notification.

- **I:** Oh, that's a lot.
- **P:** Okay so we mean different things. Yeah but I wouldn't, I mean, I haven't checked it so… So it's not something that I use. But I did remember going in to introduce myself and then not doing anything else after.
- **I:** Okay.
- **P:** …If you can sort of filter this, so you don't get everything, then that might… I mean so you only get like organizers information or… whatever, student information.
- **I:** So it's more like push notifications what we are discussing. But I know that for a lot of people, even for myself, it's very annoying to have a lot of notifications, so what I'm thinking for the current project would be something that's not many notifications which are going to annoy people, but notifications which are kind of going to motivate them to go on the conference, so it could be something inspirational for newcomers.
- **P:** Yeah… I think it's important to know for most people going I think funding is the main motivator. So if you have a paper there, chances that you'll go are much higher than if you're just… not a lot of people are going just to browse or like meet people. Of course people here are maybe different because they don't have a lot of cost related to going, but international people then I think the motivational part should be before submission and then obviously for people here it could be some other activities. Like this is a big conference, a lot of people are going here, so if you want to see some talks and so on… But I think that is sort of the main thing for the conference is… usually the same people going from an international group. And then a lot of people from the local community and then people who are already have sort of schedule, okay they know that there is a deadline coming in the fall and maybe they are already writing a paper now, because they know it will come so… they're in that sort of cycle of publishing. And that is just how it works for many researchers. And of course there will be Phd students but they would usually be motivated by the doctoral consortium and then umm hopefully also paper if they have something to publish. So I think a lot of that activity motivating would be very difficult if you don't have a paper actually. I mean for the international group.
- **I:** Yeah, so why do you think that the doctoral consortium would be motivational?
- **P:** Uh, well, um, for a few different reasons. One is obviously that a lot of phd students have to gather ECTS, just like regular students, and umm you could do that on doctoral consortiums in many cases. And also of course phd courses, but doctoral consortium is a way to do that. And also combine it with maybe publishing a paper. So I think, I actually never attended one, because the one I applied for was a very popular one in a different community but it had like an acceptance range of 20% or something so it was very difficult to get in. But I think the reason I didn't do the doctoral consortium the last time was because I was handing in my thesis like 14 days later so I didn't need the ECTS. So I think that is the main motivation for students, the ECTS. But also of course the community and these are the people who will be the famous Persuasive Design researchers of the future. So I can say they need each other and exchange experiences and stuff. I think it is a nice community to be part of.
- **I:** Okay. And I have one last question, which is again back to notifications…

19. Say that there is an app which is intended for the conference but also before … Would you allow notifications?

- **P:** I think so, I usually do and then if it gets too much, I turn it off. I usually give it the benefit of the doubt and then with this (app) one I can see I turn it off. And I think it was because it got too

much. And because I'm usually, I'm very like umm, like a person who would, if I feel obligated to do it then I will and then in the beginning, you know, getting notification in itself is sort of pressure so something is here you should look at it, you should look at it… Umm, and then if you don't then you just feel bad about not doing that and then you just turn it off and then it disappears (laughs). Umm… so I think if I find, I think we're quite pretty cool with the sense that if I find very quickly that this is not very relevant information for me then I would turn it off very quickly. Whereas if the first few notifications that I get are things that I appreciate knowing and that are relevant, then I would be more sort of inclined to keep it like that. But if I have 230 something notifications then… yeah.

- **I:** Okay and a followup to that. Could you give an example of what you would like to be notified for? Because you say that if you see something interesting then of course you wouldn't turn it off.
- **P:** Yeah I mean, like before the conference it could be nice to know when all the papers have been reviewed, maybe the acceptance rate. Umm, when the program is finished, would also be one that could be nice. When important information is updated about the venue or about the hotels… I think the last conference I was at many of the hotels that were booked for the conference got actually full quite quickly and that would have been nice to know… So I think that, so information like that in the planning phase would be really nice. Umm and then during the conference I think that would be more like social uh activities or umm, changes in the program of course would be very nice to know also. So important stuff and I think if the social part could be something that you can tick off then… because it is a nice thing if you're alone at the conference, I think I would use it more, but I just never, I've never gone to conference completely by myself. There's always been one or two people that I knew before or either travel with me or I am meeting there. So I haven't really experienced that. But I do actually this summer plan to go on a conference on my own, so I think I would be motivated to seek that type of information more.
- **I:** Okay. Umm, you mentioned about program changes. Has it ever happened when you were at any conference?
- **P:** I think there has been, yes, a cancellation of a Key Note, because of something urgent.
- **I:** And you got on the last moment or… ?
- **P:** Yes. I think they just it wasn't in the morning so there was sort of a like a void in the program, but if it was a morning thing then it could have been nice to know…
- **I:** So you could re-adjust your program?
- **P:** Yes! Yes, I think they kind of shift some things around or something, but so also that was because of, there were actually a few changes in the program because people had issues with visa… So some people couldn't get in so there were some quite a lot of program changes actually… So I think that is, and I was part of the organizing people there, so I'm new, but I think that a lot of people… It's is difficult to get information… that would have been nice- to have a way to contact all the participants in a way or give them information more directly.