

**SERVICE DESIGN  
AND INFORMATION ARCHITECTURE  
FOR COLLABORATIVE PLATFORM**

Case: Digital Silver Hub



Master's thesis

Visamäki, Intelligent services in digital environment

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Älykkäät palvelut digitaalisessa ympäristössä

Visamäki

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#### TIIVISTELMÄ

Tämän opinnäytetyön tarkoituksena on edistää ihmiskeskeistä lähestymistapaa digitaalisten verkkopalvelujen sekä niiden konseptien suunnittelussa ja kehittämisessä. Ihmiskeskeisten ja yhteistyösuunnitteluun perustuvien palvelumuotoiluperiaatteiden ja menetelmien laaja käyttö tukee uusien teknologioiden, digitaalisten tuotteiden ja käyttöliittymien kehittämistä. Tässä työssä tutkitaan sitä, kuinka palvelumuotoilumenetelmät voidaan käytännössä integroida Digital Silver Hub (DSH) -yhteistyöalustan informaatioarkkitehtuurin kehittämisprosessiin.

Teoreettinen kehys pohjautuu ammattikirjallisuuteen, joka sisältää keskusteluja asiaankuuluvista teorioista ja aikaisemmista tutkimustuloksista informaatioarkkitehtuurista ja ihmiskeskeisen suunnittelulogiikan kehittämisestä. Tutkimus tehtiin kvalitatiivisia menetelmiä soveltaen. Työssä hyödynnettiin syksyllä 2019 kerätty haastatteluaineisto. Empiirinen data-analyysi toteutettiin käyttäen palvelumuotoilun ajatuskarttamenetelmää ja sisältöanalyysimenetelmiä. Analyysin tuloksena syntyi yleiskuva sidosryhmien ja asiakkaiden tarpeista, haasteista, palveluideoista ja ratkaisuista uudelle DSH-yhteistyöalustalle. Tulokset esitettiin SWOT-matriisissa.

Tutkimuksen soveltuvana tuloksena kehitettiin informaatioarkkitehtuurin visuaaliset artefaktit, kuten DSH-yhteistyöalustan sivustokartta ja wireframe. Tutkimustulokset osoittivat, että palvelumuotoilumenetelmiä voidaan käyttää menestyksekkäästi ja tehokkaasti digitaalisen projektin tietoarkkitehtuurin kehittämisessä.

Tutkimus toteutettiin osana Hämeen ammattikorkeakoulun (HAMK) koordinoimaa Interreg BSR OSIRIS -hanketta.

**Avainsanat** Palvelumuotoilu, Informaatioarkkitehtuuri, Poikkitieteellisyys

**Sivut** 78 sivua, joista liitteitä 5 sivua

Intelligent services in digital environment

Visamäki

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ABSTRACT

The current research promotes a human-centered approach applicable to the design and development of digital online services, and concepts. Nowadays, the Service Design principles and methods, based on human-centered and collaborative design, are widely used to support the transformation and development of new technologies, digital products, and user interfaces. The main objective is to study how the Service Design methods can be integrated in practice into the Information Architecture development process of the Digital Silver Hub (DSH) collaborative platform.

The theoretical framework was constructed based on a literature review, which includes discussions on the relevant theories and past research findings regarding the development of digital platform Information Architecture and human-centered design logic. The research was carried out employing a qualitative approach with individual interviews conducted in the fall of 2019. A Service Design mind mapping for structuring interview data and thematic analysis methods were utilised to analyse the collected empirical data. The findings offer an overall overview of future stakeholders' and customers' needs, challenges, service ideas, and solutions for the new DSH collaborative platform. The findings were organised and presented in the SWOT matrix.

The research findings have led to a proposition of Information Architecture visual outcomes (artifacts), such as sitemap and wireframe of the DSH collaborative platform. The research results showed that Service Design methods can be successfully and effectively used in the development of the Information Architecture of a digital project.

The research is implemented within the framework of Interreg BSR OSIRIS project that has been coordinated by the Häme University of Applied Sciences (HAMK).

**Keywords** Service Design, Information Architecture, Human-Centered Approach

**Pages** 78 pages including appendices 5 pages

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# 1 INTRODUCTION

## 1.1 Background

### 1.1.1. Market Background

The population of the EU-27 on 1 January 2019 was estimated at 446.8 million. According to the statistics, 20.3% of the population in the EU is over 65 years old. Additionally, all demographic projection converges on the same prediction: by 2050-2070, stating that the human population will be older than nowadays, and the proportion of very elderly people over 80 years old will increase sharply (*Population structure and ageing, 2020*).

The patterns in demographic situations bring new challenges and opportunities. The customer behavior in different age groups changes constantly. The same relates to elderly people. Precisely, changes may occur due to the growth of needs and services related to the health and well-being of elderly people, as well as the current trend showing that older people prefer to keep on living in their homes. Those factors bring us new perspectives on the silver economy.

The term of "Silver Economy" comes from the "silver market" term, which covers all goods and services intended for older people. These products and services are aimed to improve the life quality of aging people without disabilities or to assist dependent elder people and their carers on a daily basis ("*Silver Economy*", 2020).

There is evidence that the world community needs to develop dedicated solutions that will respond to the demographic evolution. Potential economic growth opportunities are spread over a broad range of novel areas. However, it can be a challenge to join different actors together and build proper communication between them in such a broad multi-sectoral field. In recent years various companies, organizations, municipalities, and projects are

looking for “silver” innovations and opportunities that will make cooperation, collaboration, and exchange of information agile (*Population structure and ageing, 2020*).

Therefore, it is important to make efforts to provide innovative actions with resources, opportunities, and instruments for effective cooperation and communication between different participants. Aiming that actions to help to share information about new developments, ideas, challenges, and services in the field of Silver Economy among all active actors, will definitely bring positive outcomes for older people and influence the quality of end-users.

### **1.1.2. Project Overview**

This research is implemented within the framework of the Interreg BSR OSIRIS project (OSIRIS) and coordinated by Häme University of Applied Sciences (HAMK). The project has started at the beginning of 2019 and will end in the summer of 2021. The aim of this international project is to strengthen and expand innovation in order to meet the specific needs of the aging population and to solve regional challenges. The project lies in the field of the Silver Economy.

One of the main objectives of the OSIRIS-project is to design, develop, and create the Digital Silver Hub (DSH), which will facilitate durability, sustainability, and transferability of project outputs. The DSH is a virtual collaborative platform that is aimed to strengthen and stimulate collaboration between innovation actors in the Baltic sea region. Additionally it creates an accessible work environment in the Silver Economy field that can be utilised after the project is finished.

The DSH is a virtual working environment for the Smart Silver Framework. At the same time, it integrates network operations from the Smart Silver Labs. It includes transnational accelerator functionalities and financial mechanisms. That function is used in order to facilitate the commercial outcome of innovative products and services, developed using the Smart Silver Framework. The main features of this platform are profiles of R&D

organizations, companies, local and national authorities, smart specialization authorities, and the end-users profile. Such instruments as forums, search&match engines for patterns and solutions, as well as network support, make the cooperation an effective and open innovation ecosystem.

The main goals of this initiative are: to encourage innovation actors in various sectors of the Silver Economy to establish new contacts for cooperation inside the Baltic area, to create new high-tech business ideas, as well as to share information between the participants. That interactive platform can support and accelerate the production and development of the ideas and services of different companies and other organizations which have common interests in the growth of the European Silver Economy. It is a flexible and responsive platform where target groups can meet, co-work & cooperate for tackling specific challenges (demographic change) and utilize Silver Economy opportunities.

The DSH is expected to become an important tool for reaching other Baltic Sea Regions (BSR) and for assuring access to any stakeholder/target group from the BSR region. At the same time, DSH will support the learning process and knowledge diffusion between innovation actors and regions.

### **1.1.3. Approach Overview**

Currently, many organizations, companies, and projects produce a huge amount of new digital platforms, services, and products. The process of developing a new product, that actually brings a product from conception to market is named a New Product Development process (NPD). Accordingly, the process of developing a new service is called the New Service Development process (NSD). There are multiple various models that propose the description of the NPD and the NSD processes. Additionally, models explore actions, methods, and techniques that are directly related to the area of developing quality products.

At the moment, there is no definite generally accepted approach for the IA of IT solutions or digital products development. There is a huge number of different approaches and



methodologies that can be used together, separately, or complementing each other.

Flexibility is a current pattern in the IT solutions approach. Traditional inflexible approaches are replaced by flexible methodologies, which can also be flexibly combined, utilising only some parts of methods and practices.

There is evidence for a long time, where the typical model for the new service or product development was oriented to the technology and company. The company develops the idea, based on the market research, then itself plans, releases, and launches a new service.

Unfortunately, sometimes the outcome is negative. It becomes clear that the service is not used by users. The company collects feedback, changes design and functionality, releases a new version. However, even after such changes, the service is used weakly or not used at all. The initial problem is that the service approach that does not adapt and satisfy customers' needs generally fails. The gap between service and customer need is evident. The reason why the service does not meet the client's (users) needs, lies in the fact that the initial analysis of the market, target group opinions and needs has not been performed correctly or has not at all. (Owens & Atherton, 2018)

In the last decade, various companies and organizations have to modify the approach and develop their services and products constantly, facing cultural and customer behavior changes. Traditionally, the technology-driven approach, that has been described above, is replaced by a flexible human-centered approach, such as the Service Design approach. (Miettinen, 2017)

The Service design is an innovative approach with a specific process, tools, and methods that involve different stakeholders in the development of new services. Utilising the Service Design approach, the service developer is able to study motivation, different customer needs, such as needs of users at the initial stage, and throughout the entire period of product planning, put it into the operation throughout the entire period of the product or service ("Service Design", 2019). As a result, it allows companies and organizations to save financial, human, and other resources, and get as an outcome a more efficient service, which is useful, convenient for users, as their preferences and needs are taken into account.

The work of creating a modern digital product begins with the development of information architecture (IA). The IA is the skeleton and the basis of the digital product or service. Essentially, the IA is half art and half science. The IA development involves processes of organising and labeling digital product content. Good IA is built on a deep understanding of the project itself, its target audience, and stakeholders. The IA designer's job is to organize and tag all content in such a way that the user can easily find and access it. (Morville, 2012)

At the moment, there are a huge number of different approaches and disciplines that research the development of digital services and have different strengths and weaknesses. The scope of this thesis is focused on the context of applicability to a particular development, and on the usage of the Service Design approach and methods for digital platform IA development. As we could notice, the scope consists of two topics. The topics are quite large and utilize a significant number of different techniques in each part. Unfortunately, not every technique is described or even mentioned.

The subject for this thesis is not narrowed and specialised, but rather widely researched how theories, methods, and tools from different fields can supplement each other. As a researcher, I will learn new knowledge in the field of IA and explore how its concepts and methods overlap with the Service Design field. Also, the question of the possibility to apply the approach and methodology of Service Design to the planning process of the IA of the DSH is considered to be important. Because of that, the work of planning the IA of the virtual DSH platform for multisectoral cross-country collaboration is ideal for this research.

## **1.2 The Research Objectives and Questions**

The research is aimed at contributing to the development of the DSH platform by providing structural design/content, and as a result, the IA practices that utilize the Service Design methods.

Logically, in relation to the research aim several questions come up:

- What are the main structural elements of the Information Architecture for the DSH?
- How the Service Design methods can be in practice integrated into the design process of Information Architecture?
- What are the practical outcomes (artifacts) of the Information Architecture?

This study is exploratory and interpretative in nature. As part of the study, a review of the platform and its capabilities will be carried out, as well as the recommendations with their consideration. The target groups of this research are potential end-users of the platform such as different organizations which are active in the Silver Economy.

Part of the technical and functional requirements for the platform development was determined at the stage of the project development and described in the project plan. These requirements are taken as a basis for further design and development in this project and are described in Appendix 1.

At the beginning of the project, it was determined that WordPress would be used as a CMS for DSH development. Because of that, the choice of the CMS or other technology for development is not researched additionally and taken into the thesis goal. Nevertheless, in the development process, it is necessary to take into account the technical and functional capabilities of the WordPress platform.

As the scope of the thesis is wide, some parts are not researched precisely. The visual design (choice of colors, fonts, etc), the User Interface (the navigation, blocks, appearance, etc.), platform technical development and other technical constraints (servers, processors, hosting, load balance, etc.) are not part of the scope of this research. Additionally, the developing IA of the intra-module (back-end) of the DSH is not part of this thesis work.

### **1.3 Structure of the Thesis**

The current research consists of five chapters, which logically follow up. It starts with an introduction where the overview of the main topics was briefly discussed. The first chapter of the thesis focuses on familiarization with problem statement and background,

requirement specifications, and building general initial understanding. The same chapter identifies the research problem and issues and contains the organization of this thesis.

The second chapter provides an overview of the literature that is relevant to this research. In the theoretical part, the research work was done to obtain and analyze the data necessary for future applied work. The theoretical study includes a literature overview, familiarization with background material, and project requirements. It considers the current professional and theoretical literature that surrounds the work of new digital product development processes, including IA development through Service Design approach. It presents the fundamental approaches, customer-dominant-logic, and human-centered design, taken on during this development project.

The research process and the outcome is presented in the Third and Fourth chapter. The third chapter discusses the research methodology, design process, and chosen methods applied in this thesis. It presents the activities carried out during each step of the design process, as well as the analysis process and overview of the project's results. The research was carried out in three parts – a pilot study (discover), main study (define), and applied study (develop). The main study includes in-depth interviews with project stakeholders. The applied research was carried out by developing a visual representation of the data received in the previous stages, sitemap creating, and wireframing.

The remaining part of the current research proceeds as follows: the research results, that are presented in the fourth chapter and the main conclusions, that are shown in the Fifth chapter.

The fourth chapter provides answers to research questions and discusses the feasibility of the project. It is focused on obtaining information and studying the understanding of the expectations of representatives of various target groups from the platform. It also covers the actual IA solution designing and wireframing process, visual outcomes, and layout solution.

The final Fifth chapter provides the conclusions of this thesis. It summarizes the phases and results of the development project, evaluates the process and results of the development project, suggests actions for future development of the Digital Service Hub concept.

## 2. LITERATURE REVIEW

The literature review provides an overview of theories and previous research efforts, that are relevant to the research questions, and points to the definitions of the main research concepts.

Thus, the literature review consists of two main parts. The first part offers a theoretical basis for developing and building the IA, tools, approaches, and risks within the development process. The second part discusses the Service Design concepts, methodologies, approaches, and tools. The subsections of this chapter present the disciplines, their key features, some tools, techniques, and methods.

### 2.1 Information Architecture

The field of Information Architecture is one of the main topics in the research. However, it is rather difficult to explain accurately what IA is. There are many definitions of IA. Such definitions have failed to describe it in a common way and some have pointed in completely opposite directions. Determining IA is not such a simple task as it might seem at first glance.

The term “**information**” was used together with the term “**architecture**” in the mid-1970s. However, at that time the term sounded like “architecture of information” and was more attached to the architecture of the computers' information systems. In the mid-80s, the idea of IA began to change. At that time IA was considered with more emphasis on the organizational and business aspects of information networks. At the same time, various tools related to the design of IA appeared such as drawings, requirements, information categories,

recommendations on internal business processes, and global corporate needs. (Resmini & Rosati, 2011)

The creation of “www” (World Wide Web, Internet) at the end of the twentieth century had an impact on IA. It has become mainly the practical tool for organising complex digital environments, including online platforms. The term “**Information Architecture**” was used more and more. However, there wasn't any exact definition for it.

Reiss (2000) describes that at the conference in Boston in 2000 organised by the American Community for Information Science, 400 experts were looking for the definition of IA over the weekend. The conference was successful in terms of networking, but failed in terms of the task, because the agreement to define the term of “**Information Architecture**” was not reached.

In 2000 Reiss in his book defined Information Architecture as the “arrangement of browser-based information (more specifically, the internal relationships between individual web pages) so visitors can do whatever they came to do with as little effort (and confusion) as possible” (Reiss, 2000, p. 5). We see that the definition used by Reiss is rather narrow and more applicable to the construction of a competitive structure and site navigation.

At the same time, in the 2000s, a Service Design methodology began to appear, which also served as an impetus for changing the approach to developing IA and its definition. New definitions are becoming more complex and voluminous. In 2015, other scholars took a multi-perspective approach and defined IA as follows (Rosenfeld et al., 2015, p. 4): “The combination of organization, labeling, and navigation schemes within an information system. The structural design of an information space to facilitate task completion and intuitive access to content. The art and science of structuring and classifying websites and intranets to help people find and manage information. An emerging discipline and community of practice focused on bringing principles of design and architecture to the digital landscape.”

One of the most profound definitions of IA is offered by Ding et al. (2017, p. 3): “Information Architecture is about organising and simplifying information for its intended users; designing, integrating, and aggregating information spaces to create usable systems or interfaces; creating ways for people to find, understand, exchange and manage information; and, therefore, stay on top of information and make the right decisions.”

In addition, in the period of years 2003 and 2020, Wikipedia has offered numerous definitions of this term. However, enormous differences could be seen between the definitions. The following examples of Wikipedia’s definitions demonstrate the diversity of scholars’ views on IA:

“In the process and context of Web design, Information Architecture is the organization of information to aid in information retrieval. A common example of this is the categorization of similar information into sections on a website, with those sections displayed in pages. Information Architects create a variety of project deliverables including Site Architecture Maps and Wireframes (also known as Page Schematics).” (“Information Architecture”, 2003)

“Information Architecture (IA) is the structural design of shared information environments; the art and science of organising and labeling websites, intranets, online communities and software to support usability and findability; and an emerging community of practice focused on bringing principles of design, architecture and information science to the digital landscape.” (“Information Architecture”, 2019)

Nowadays the amount of information rapidly increases. At the same time increase the number of various devices and services. The rapid changes create a challenge for people how and where to find the necessary information. However, IA is the area that helps to solve this problem, make information findable and understandable, and also supports people to manage and use the information.

According to Morville (2012), IA builds bridges between:

- Users and Content

- Strategy and Tactics
- Units and Disciplines
- Platforms and Channels
- Research and Practice

IA is closely related to other disciplines, for example, graphic design, interaction design, usability engineering, experience design, content, and knowledge management. The focus of IA is not only on high-level abstract models such as the design of products and services that are findable and understandable but requires the creation of many low-level artifacts as well. Effective information environments strike a balance between structural coherence (high-level invariance) and suppleness (low-level flexibility), so well-designed IA considers both. It is worth being familiar first with the initial notions before the concept of IA structure will be researched.

### 2.1.1 The Concept of IA

IA gurus Louis Rosenfeld, Peter Morville, and Jorge Arango defined the “three circles of Information Architecture” as content, users, and context of use. Those circles mean the interdependent nature of users, content, and context within a complex and adaptive information ecology. (Rosenfeld et al., 2015)

Figure 1. Three circles of IA (Rosenfeld et al., 2015).

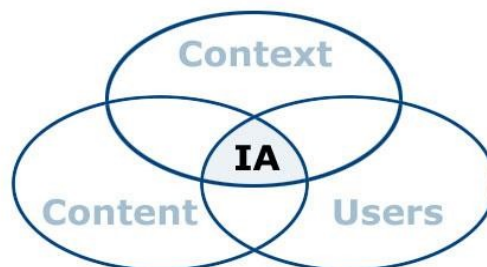


Figure 1 shows and describes three circles of IA. It also means that we need to understand the business goals and resources available for the Service Design implementation. Good IA



should take into account all three areas. All of them can vary by different parameters, shown in Table 1.

Table 1. Different parameters of users, content, and context.

USERS	CONTENT	CONTEXT
understand behaviors, goals, and needs; environment and culture; attitude, demographics, psychographics, tasks and information needs, information-seeking behaviors and more	Who creates, updates, or maintains and owns the content? quality, currency, authority, popularity, strategic value, cost, and more	mission, vision, goals and objectives, technical infrastructure, schedules, budget, etc.

Being introduced to the conceptual structure of IA, we can determine the components of IA. Morville and Rosenfeld (2006) argue that IA have four fundamental systems to organize information: organization systems, navigation systems, search systems, labeling systems. In that specific area, common industry practices are also important for the architect. He should know such aspects as how to control vocabularies and metadata, which is used to ensure every category label means only one precise thing each time it has been used.

### 2.1.2 Organizations systems

The rapidly increasing amount of information creates a need for innovation in content organization. Organization systems focus on categorization and structuring information. Organization systems present the site's information in a variety of ways or to a specific audience. The organization of information is rather a complex process since the same information can be viewed and classified from various points of view, for example, by ambiguity, heterogeneity, differences in perspectives, internal politics.

The organization systems can be divided into *organization schemes* and *organization structures*. The organizational scheme defines the shared characteristics of content elements and, thus, affects the logical grouping of these elements. The organization structure defines

the types of relationships between content items and groups. Organizational structures are closely associated with navigation, labeling, and indexing, and often play the part of the primary navigation system. (Rosenfeld et al., 2015)

### **2.1.3 Labeling Systems**

Labeling systems are the ways we represent information and a relationship between users and content, at the same time it answers the question of how one represents the information. Labels show to the user the organization and navigation systems, so we should consider a level of terminology that is appropriate for the target audience and describes categories, options, and links in language that are meaningful to the end-users. One of the examples can be the usage of the terms an "optometrist" and an "ophthalmologist," or an "eye doctor" is more appropriate for labeling links in the navigation system. (Rosenfeld et al., 2015)

Consistency is one of the characteristics that makes labeling systems successful, and at the same time, which makes systems predictable and easier to learn. The system is consistent, in the case when the user sees one or two labels, and then knows what to expect from the rest. Consistency is affected by many issues, such as style, presentation, syntax, granularity, comprehensiveness, audience. (ibid)

The website navigation panel usually doesn't have much space to use long labels. It is good to spend time and think about how to design the labeling system and labels itself. There are no standards on how to design the labels, however, Rosenfeld et al. (2015) give good examples of labeling systems from the United, Delta, Virgin America, and American Airlines. (Figure 2)

Figure 2. Labeling systems from United, Delta, Virgin America, and American Airlines (Rosenfeld et al., 2015)

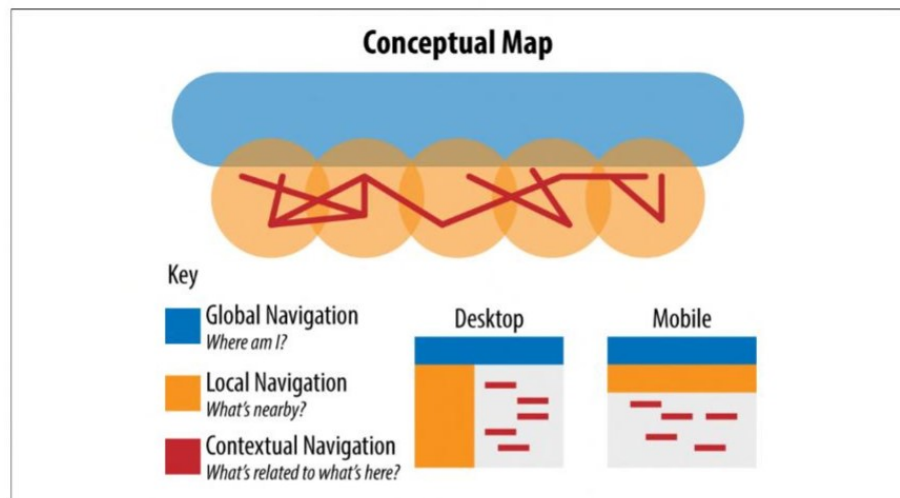
<b>United</b> Home Reservations Travel Information Deals & Offers MileagePlus® Products & Services United	<b>Delta</b> My Trips Book a Trip Flight Status Check In Vacations
<b>Virgin America</b> Book Check In Manage Deals Flying With Us Where We Fly Fees Flight Status Flight Alerts	<b>American Airlines</b> Find Flights My Trips / Check-In Flight Status Plan Travel Travel Information AAdvantage

There are two types of labels: textual and iconic labels. The textual labels include contextual links, headings, navigation system options, and index terms. The iconic labels are less common because they can be confusing to users. Unprofessional labels of a website may destroy a user's confidence in that organization. (Rosenfeld et al., 2015)

#### 2.1.4 Navigation Systems

Navigation systems are the way how users browse or move through the information and they are one of the most important areas on the website. Navigation systems are composed of various types and the three most common ones are global, local, and contextual systems. Those three major systems are shown in Figure 3.

Figure 3. Global, local, and contextual embedded navigation systems. (Rosenfeld et al., 2015)



The global navigation systems are intended to be presented on every page or screen throughout a site and often implemented in the form of a navigation bar at the top of each page. Local navigation systems usually complement global ones and are often located on the left or right side of the website. It allows users to explore the immediate area where they are. The contextual navigation systems are used within the content, and support associative learning, allowing users to explore the relationships between elements. (Rosenfeld et al., 2015)

There are also supplemental navigation systems that exist outside the content-bearing pages. The supplemental navigation systems include sitemaps, indexes, guides, wizards, and configurators. Those systems provide alternative ways of accessing the same information and they are external to the basic hierarchy of a website. Additionally, the advanced navigation approaches appeared along with the development of new technologies and devices. Examples of it are personalization, visualization, tag clouds, collaborative filtering, and social navigation (ibid).

The web portal presents information from various sources in a single form. Unlike static web pages, a portal often requires an act of sign-in. This allows the portal's functions to adapt to

the functional needs of different target groups. Personalization makes portals more attractive to the user. (Ofoegbu et al., 2014)

### 2.1.5 Search Systems

Searching systems are the way how the user search for information, narrow the results, and get closer to the topics he wants to read about. Searching systems are not always used on a website, and before we start to build a search system, we should ask: Does the website need a search function?

At least, the following issues should be considered before committing to a search system:

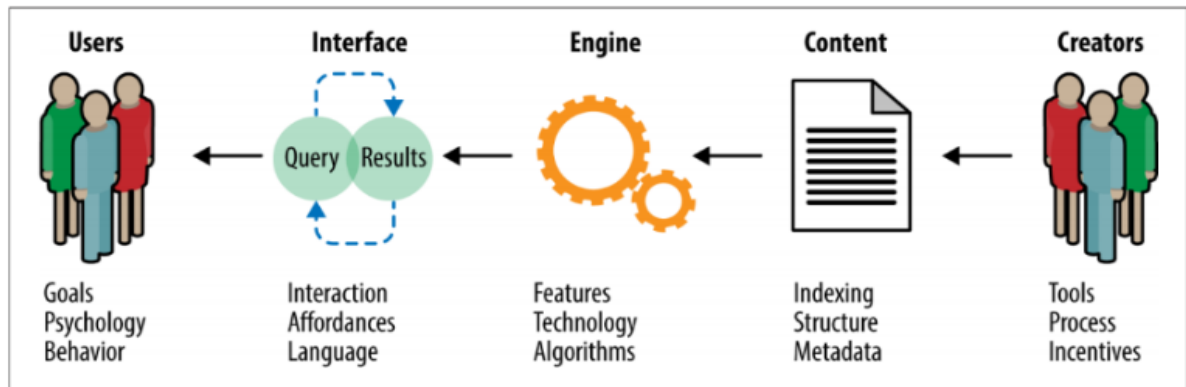
- amount of the content in the information environment,
- focus on more useful navigation systems,
- responsibilities to optimize and maintain the search engine.

Also, the following issues shows, when the environment has reached the point of need in a search system:

- when the user has too much information to browse,
- fragmented sites,
- a search is a learning tool,
- search should be there because users expect it to be there,
- search can tame dynamism.

The search system is not only a search box in the interface, but it is a composition of many different parts and technologies. A lot of things going on under the hood. There could be different interfaces for the entering queries, like simple search boxes, advanced natural-language, or the voice-driven interface for the entering queries. Also, there could be different interfaces for displaying the results, including the decisions on what and how to show the results. The basic anatomy of the search system and some pathways is shown in Figure 4.

Figure 4. The basic anatomy of a search system (Rosenfeld et al., 2015)



The figure also shows the ongoing process that starts from the creators, follows up the required steps and interactions to reach the end-user.

### 2.1.6 Deliverables and Visualization of IA

As it was described in the sections above, IA is the abstract, conceptual, and multidimensional concept. Digital information can be presented by countless options, and therefore it makes it exceedingly difficult to present information in a two-dimensional space such as a sheet of paper. According to Merville et al. (2015), there is no ideal solution for this presentation.

Information architects should provide multiple “views” of IA to display its different aspects. Some of the classic deliverables that come out of the architect’s work are wireframes, prototypes, site maps, personas, and flowcharts. **Sitemaps** and **wireframes** are diagrams that are most frequently used. (Rosenfeld et al., 2015)

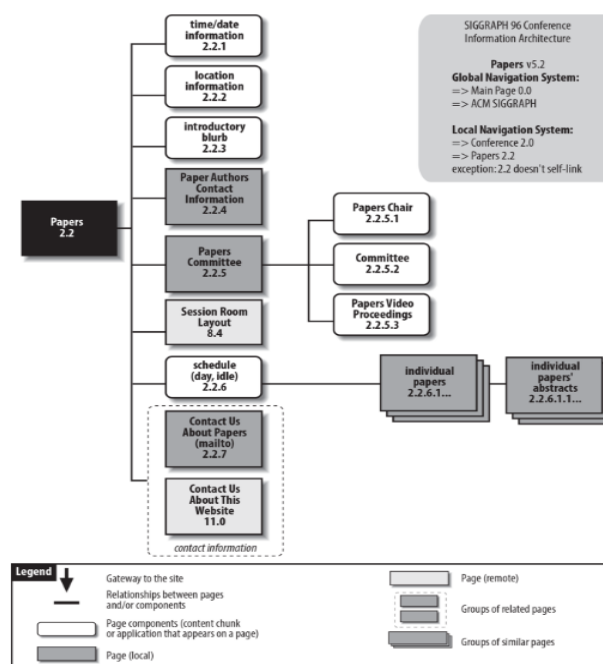
#### Sitemaps

Sitemaps are diagrams, which show the relationship between information elements such as pages and other content components, and can be used to portray organization, navigation, and labeling systems, and at the same time sitemaps do not contain much information. They focus on the main areas and structures of the site. Two types of sitemaps can be

distinguished: the high-level architecture sitemaps and the detailed sitemaps. (Rosenfeld et al., 2015)

The high-level sitemaps help to explore primary organization schemes and approaches. The detailed Sitemaps describe the detailed organization, labeling, and navigation decisions. These sitemaps present the complete information hierarchy from the main page to the destination pages, and can (and should) be developed along with the rest of the project to meet new conditions and requirements that arise during the development process in such projects (Rosenfeld et al., 2015). Figure 5 illustrates an example of a detailed level sitemap.

Figure 5. A sitemap of a major section of the SIGGRAPH conference website (Rosenfeld et al., 2015)



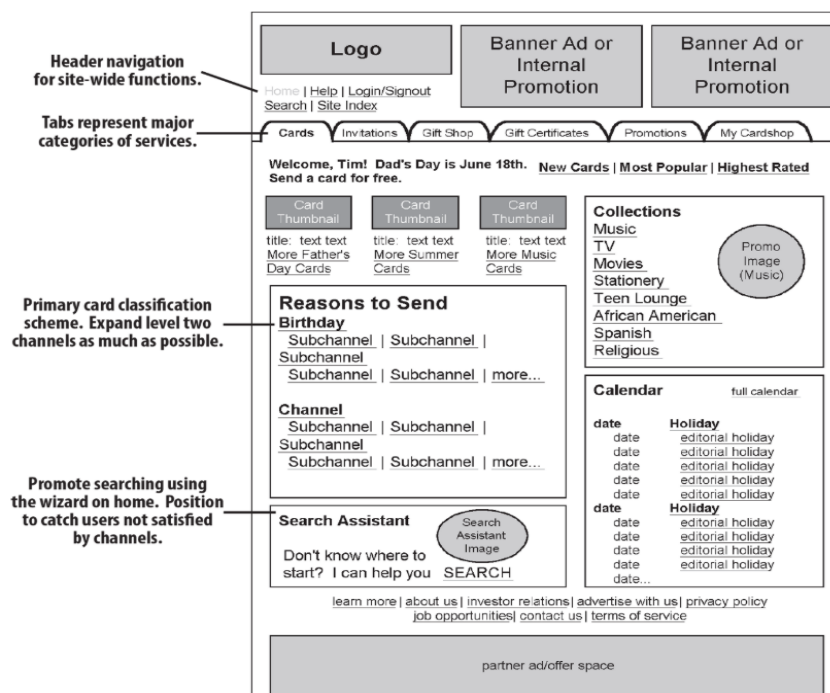
## Wireframes

Wireframes depict how an individual page or template should look from an architectural perspective. It means that multidimensional architecture is constrained in size, and should be fitted and visible in two-dimensional space (e.g., pages, screens). There is no set goal to

create wireframes for every page or screen in the system, but most likely wireframes are usually created for the most important pages or screens - such as main pages, major category pages, search interfaces, and other complicated or unique pages or screens. Wireframes help to explore how the page structure is displayed on the phone, tablet, and desktop browsers, depending on the screen size.

Wireframes represent the total look and provide some feelings of a product or service. Basically, they represent a frontier area where many web design-related disciplines come together and frequently clash. Therefore, it is recommended that wireframes should not be a substitute for "real visual design". The fonts, colors, and other visual characteristics are not part of IA (Rosenfeld et al., 2015). Figure 6 illustrates an example of a main-page wireframe at the greeting card site

Figure 6. A wireframe of the main page at the greeting card site (Rosenfeld et al., 2015).



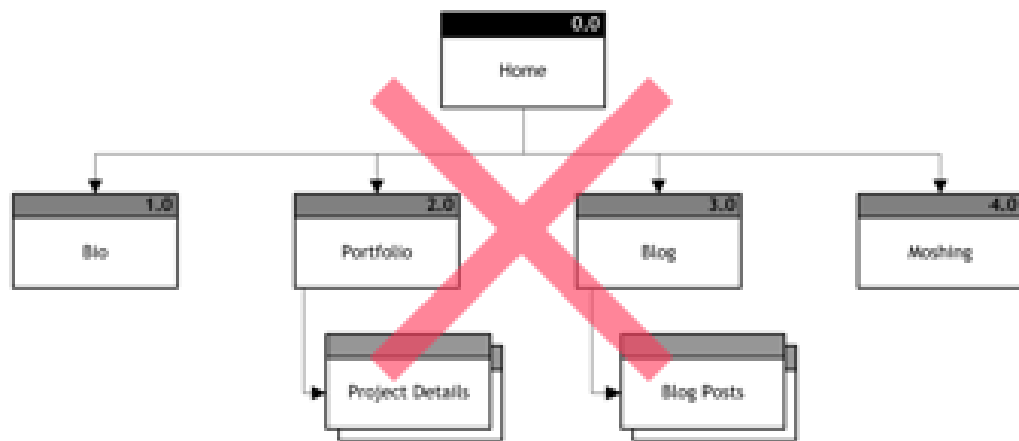
Visualising the IA is important when there is a need to describe it to other people. However, the well-designed IA is invisible to users. At the moment when users land on the website, he or she sees immediately the visual design of the pages. For example, the colors, the number



of columns, images, font types, use of mouseovers, and pull-down menus. These elements do not belong to the areas of the IA. (Morville & Rosenfeld, 2006)

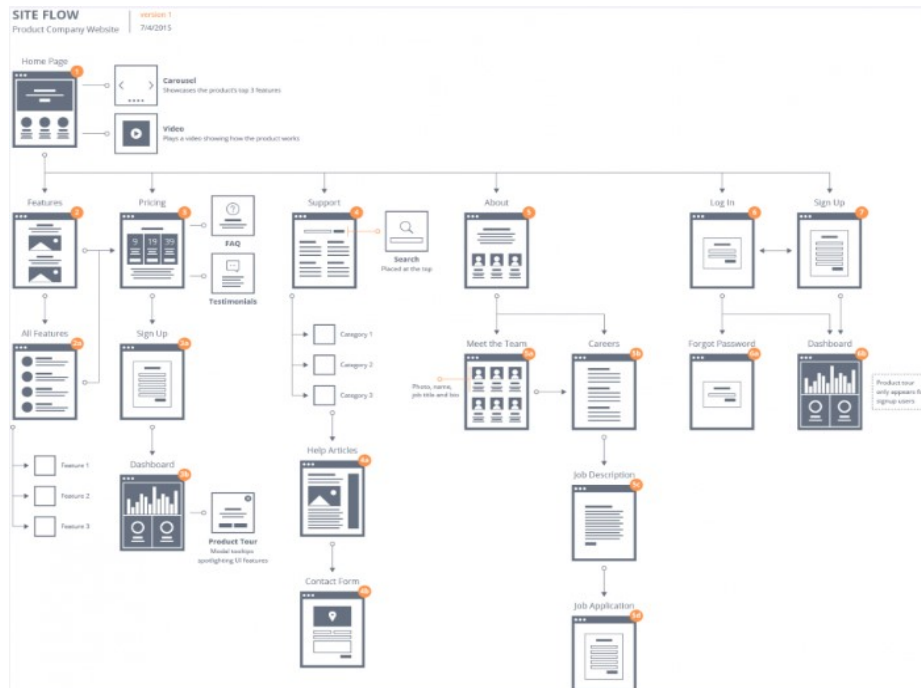
According to Anthony (2015), traditional sitemaps force clients to read their site structure instead of visualising it. Figure 7 illustrates traditional boxes and arrows, and the author doesn't recommend them to use in modern development, because they are not detailed enough to paint a clear vision.

Figure 7. Traditional visualising of site structure (Anthony, 2015)



Instead of this, using visual site flows, which can illustrate the overall look and feel of each page, are the way to excite and inspire clients and stakeholders. An example of such a modern visual site flow is shown in Figure 8.

Figure 8. Modern visual representation of the site flow (Anthony, 2015)



Such sitemaps are visually detailed and compelling. Site flow shows the structure and hierarchy of a website, and at the same time gives a possibility to see the unique micro-interactions on certain pages (Anthony, 2015).

As well as sitemaps, wireframes come in different shapes and sizes, and the level of accuracy may be dependent on the goals and stage of development. Wireframes can be hand-drawn or created in HTML or Adobe Illustrator. Depending on the stage of the development, they can be more or less schematic. There are three levels of fidelity: low-fidelity wireframe, medium-fidelity wireframe with a high amount of details, and high-fidelity wireframe that presents more precisely how the page will actually look like. (Morville et al., 2015)

## 2.2 Service Design

According to Brooks (2010), the most difficult design task is to determine what needs should be satisfied with a designed project. For many decades, a rational outlook on the design of IT solutions has prevailed. Typically the work process follows similar steps, such as the work

begins after the analyst has formulated the requirements, discussed, agreed, and approved them with the customer. Then the architect receives a clearly defined task, develops possible solutions, and offers an optimal implementation option.

However, at the first stage of any IT, digital product, or service development, architects very poorly create the final result that satisfies customers' and stakeholders' needs. They can create a decent presentation, but adding details to a specific level is a big challenge. They can plan and develop great technical solutions for digital services or products, however, if the gap between the service itself and customer needs is huge, the service may be unpopular and not have enough demand.

Nowadays, the role of an IT architect has changed fundamentally. For the reasons above, the traditional approaches to develop digital systems in today's rapidly changing world no longer work. The traditional approach has been replaced by flexible models and approaches, that let to plan and develop digital products and services more precisely. One of such approaches is the Service Design approach, which is user-centered, multidisciplinary, and holistic.

Service Design is a fairly new concept that has been presented as an academic field in design research and education at the University of Applied Sciences in Cologne in the early 1990s. At that time, the design was understood as stylization and visual decoration of the product, which made the product attractive and added some financial value. At the same time, there was an urgent need to combine Service Design with the relevant business needs. This association has allowed Service Design to become part of a holistic and innovative design approach (Miettinen & Koivisto, 2009). Currently, Service Design is a fairly consolidated discipline with its own set of conceptual and practical tools.

Nowadays, Service Design has a wide variety of definitions. In general, Service Design serves to improve the interaction between the service provider and the customer by proper planning and organising participants' actions, infrastructure, communication, and material components in an effective way. The biggest advantage of that approach is that needs of all stakeholders are taken into account.

Miettinen and Koivisto (2009) give such a definition of Service Design: "Service Design addresses the functionality and form of services from the perspective of the user. It aims to ensure that service interfaces are useful, usable, and desirable from the client's point of view and effective, efficient, and distinctive from the supplier's point of view" (p. 34).

It is not easy to give a simple definition to the Service Design term, because of its complex, interdisciplinary and evolving nature. The main innovation and priority mission of Service Design is to develop solutions based on customer's needs, following the customer-centered design thinking. The customer-centered design extends the idea of just end user-centered design and means that all stakeholders, who are involved in the production of the designed solution should be considered before the technology or the economics. (Han, 2011)

Because of that, Service Design is focused on solving the exact problem and investigating the needs of the user or customer, instead of jumping straight to a "solution" (Stickdorn et al., 2018).

### **2.2.1 Process and Principles**

The principles of Service Design must be taken into account throughout the Service Design process. In 2010 Marc Stickdorn and Jakob Schneider in their definitive book 'This is Service Design Thinking' offered five core principles of Service Design as **1. User-Centred, 2. Co-Creative, 3. Sequencing, 4. Evidencing and 5. Holistic** (Stickdorn and Schneider, 2010). Those principles were widely used until 2018.

Later Stickdorn et al. (2018) offered the new interpretation of Service Design principles, which are:

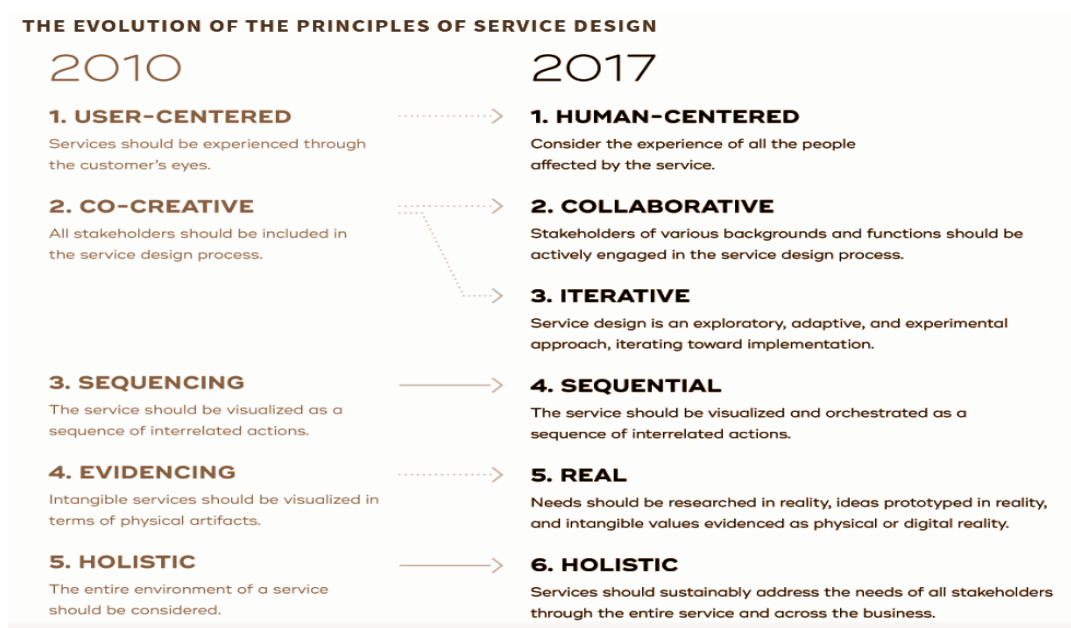
1. **Human-centered**: consider the experience of all people affected by the service.
2. **Collaborative**: stakeholders with various backgrounds and functions should be actively engaged in the Service Design process.

3. **Iterative:** Service Design is an exploratory, adaptive, and experimental approach, iterating toward implementation.
4. **Sequential:** the service should be visualised and orchestrated as a sequence of interrelated actions.
5. **Real:** needs should be researched in reality, ideas prototyped in reality, and intangible values evidenced as physical or digital reality.
6. **Holistic:** services should sustainably address the needs of all stakeholders through the entire service and across the business.

Theoretical and practical knowledge about Service Design is constantly being updated.

Figure 9 illustrates the evolution of the principle of Service Design from 2010 to 2017.

Figure 9. The evolution of the principles of Service Design (Stickdorn et al., 2018)



The Service Design process is a non-linear outside-in approach and begins with the development of the process itself, depending on the goals of the project.

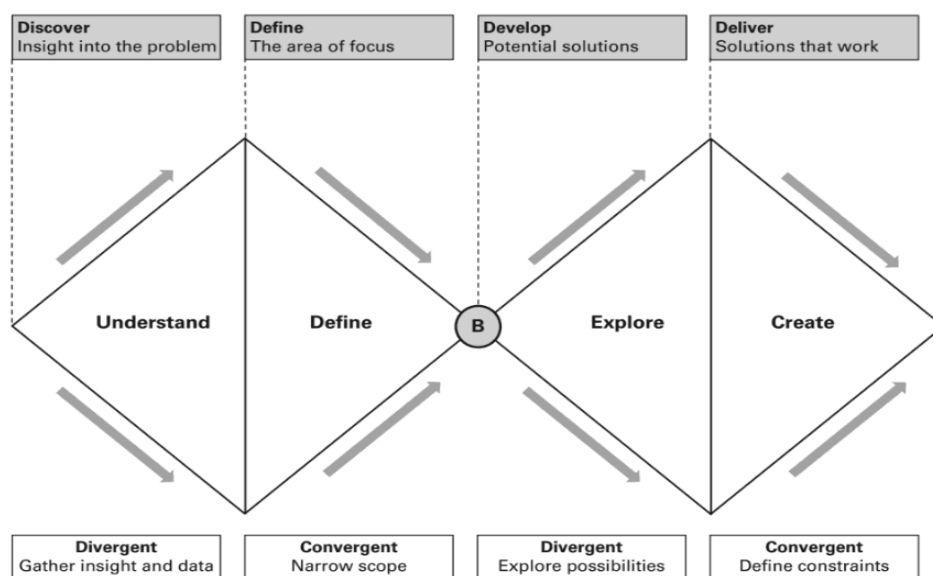
The core element of any design process is the recurring pattern of creating and reducing options, which can be described as **divergent and convergent thinking** and doing. The

psychologist J.P. Guilford first coined the terms convergent thinking and divergent thinking in 1956. Those terms were introduced into the design area and later in 1980 by architect Paul Laveau. Later Stickdorn et al. (2018) distinguished divergent and convergent thinking in the following way: “ **Divergent thinking** means that we think broadly, keep an open mind and eyes, consider anything and everything. **Convergent thinking** means that we think narrowly, bring back focus and identify one or two key problems and solutions ” (p. 85).

One widely applied Service Design process, which utilizes a “divergent” and “convergent thinking” approach, is the “**Double Diamond**”. Double Diamond is a design process model, developed by the Design Council in 2005, whose research team worked closely with 11 international design-based companies to understand and establish a generic design process model.

Researchers have noticed that even though companies had very different ways of managing the design process, there are some core stages within a design process that are common across the participating companies (Hands, 2018). Utilising that common stages and logically putting them into a process of iterations, the Double Diamond model has been created. The key stages of the Double Diamond model are illustrated in Figure 10.

Figure 10. Design Council "Double Diamond" model 2005 (Hands, 2018)



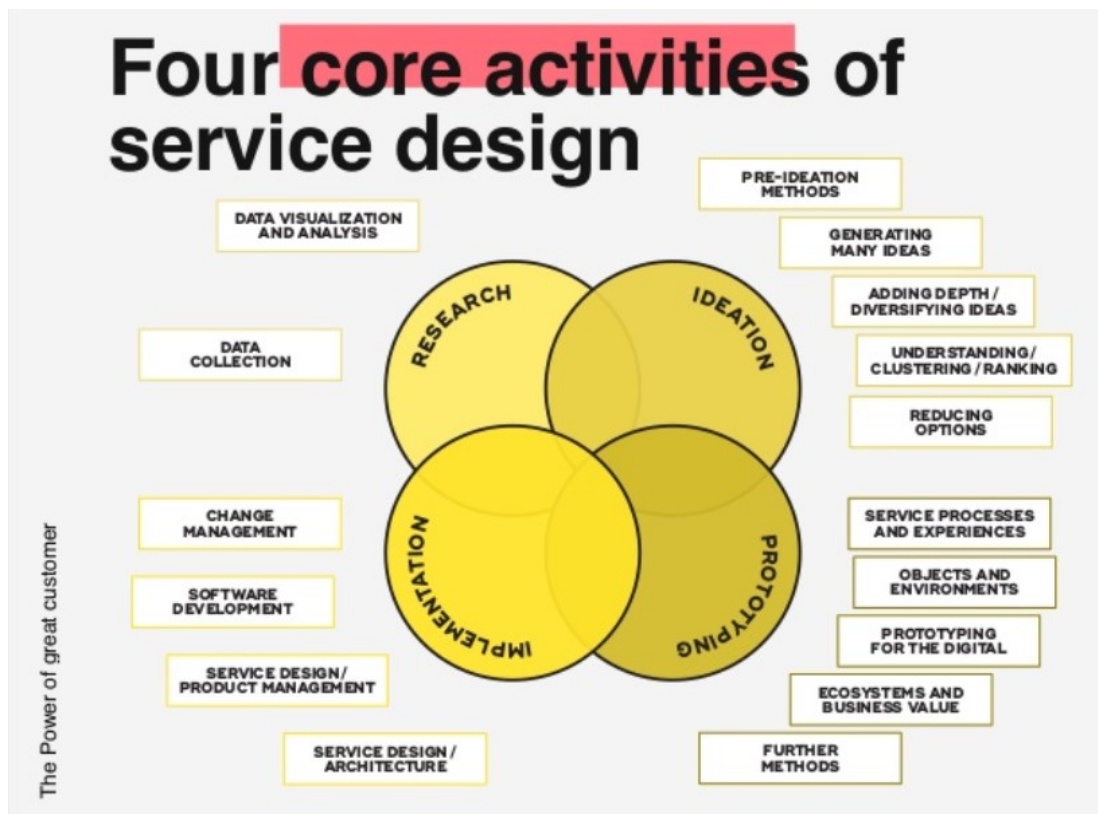
The Double Diamond model shows the design process which is divided into four stages: discover, define, develop and deliver. In the **discovery phase**, we practice divergent thinking. That means that we open our minds and look at the situation with fresh eyes, gather insights and data, and understand the current situation. The process itself is constrained by nothing.

In the **defined phase**, we start to use convergent thinking and our goal is to focus on key areas now. At that stage, the researcher starts to converge the elements, solves and develops a clear brief of the design challenge, based on the findings identified in the preceding stage. The design challenge is the key finding at that stage.

Next follows the development phase. In the **development phase**, we practice divergent thinking again and the goal is to ideate and create potential solutions and iteratively develop them further by prototyping. In the final **delivery phase**, the goal is to finalize the results of the project, and the researcher practices convergent thinking again. In this phase, the focus is to choose and deliver the solution which solves users and customer needs. (Hands, 2018)

The above stages relate to the following core activities of the Service Design process: research, ideation, prototyping, and implementation, which are the major building blocks of a working Service Design project. Those four core activities are not mutually exclusive, they can overlap and contain some elements from each other. Core activities and possible overlaps are shown in Figure 11.

Figure 11. Four core activities of Service Design. (Mourrieras & Hormness, 2018)



### 2.2.2 Tools and Methods

In a Service Design process, it is sometimes difficult to understand the difference between methods and tools. However, there is a significant difference between them. Each phase of the Service Design process such as research, ideation, prototyping, implementation has its own internal processes, methods, tools, and outcomes.

**Methods** are specific procedures and processes to accomplish or approach something. The method may conduct a contextual interview as a research method or pass desktop games as a prototyping method. (Stickdorn et al., 2018)

**Tools** use the question “what” do we use, while methods usually reveal the “how” we create and work with specific tools in the Service Design projects. Service Design tools have a very important role in developing new services and products. At the same time, they are usually



attached to the development process and categorised under different phases. There are a huge number of 3699 tools, which can be used in the Service Design process, while the variation of tools is wide and still growing.

Tools are specific models such as mind-maps, personas, service blueprints, user journeys maps, spreadsheets, storyboard templates, etc, that usually have a predefined structure or pattern.

Tools themselves are divided into different groups according to the processes, functions, and components that are involved in them. The Figure 12 represents part of the classification of several different tools. However, in the world of Service Design, there are a huge number of tools, while the different names and combinations of the same tools are also used. The design process, methods, and tools are always selected depending on the project, goal, budget, and time. (Polaine et al., 2013)

Figure 12. Service Design tools (Chung, 2017)



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Service Design tools are usually visual, fast, lightweight, and easy to understand. At first sight, the tools may seem very simple. However, in reality, the simplicity of the tool makes the approach very powerful, since even complex services can be presented at an understandable level to the team. The task of Service Design is not to show and embrace the complexity of the service system, but rather, filter out complexity through the design mentality. This approach provides an opportunity for effective collaboration for cross-functional teams, which can understand services on a practical and a human, empathic level. (Stickdorn et al., 2018)

In-Service Design using the right design tools and methods is crucial, because of the overall process in creating the right touchpoint at the design process. There are several design tools that facilitate the innovation process and which could be used to understand the customer and user needs and behavior profoundly.

Often, such processes as research, development, designing, and implementing of service or product involve different teams or people, while the service testing with the end-user is performed in the final phase of the service development. However, since one of the principles for effective Service Design is co-creation, most Service Design tools are designed to be used in a multidisciplinary team. Graphic representations and visualizations are widely used for the Service Design process (Segelström, 2010).

Visualization, serving as a bridge between the information collection phase and the later stages, takes a key place in the design process. Visualization in the Service Design simultaneously plays the role of an important tool at the research stage and a communicative role. Visual tools help to speed up the process and understand, at the same time make things tangible, and help participants move from theoretical thinking to practical implementation. (Stickdorn et al., 2018)

Now, when we have a complete understanding of the principles, processes, tools, and methods of the Service Design, we can formulate a complete, clarifying definition of Service Design (Stickdorn et al., 2018): "It is a human-centered, collaborative, interdisciplinary, interactive approach which uses research, prototyping, and a set of easily understood activities and visualization tools to create and orchestrate experiences that meet the needs of the business, the user, and other stakeholders " (p. 27).

### **3. RESEARCH METHODOLOGY**

The purpose of this chapter is to describe the methodology and methods chosen for the current research. The chapter is structured as follows: an overview of different research types and the choice of the research methods. This is followed by an overview of the data collection and research design. The chapter ends with the provision of data analysis methods.

### **3.1 Types of Research**

Choosing an appropriate research methodology is one of the most difficult decisions for most researchers. The type of the research will determine the correct research methodologies, methods of data collection, and research. The choice of a research approach also depends on the nature of the problem, the question being investigated, the personal experience of the researcher, and the audience of the study. (Collis & Hussey, 2014)

Research methods include various ways by which empirical data can be collected and analysed (Collis & Hussey, 2014). Different researches suggest different approaches to research. The main guideline for the methodology choice is the overall research goal. By Kothari (2004), research methodology is a way to systematically solve the research problem.

Most of the researchers pick out the basic types of the research such as Descriptive vs. Analytical, Applied vs. Fundamental, Quantitative vs. Qualitative. Slightly differently according to Kothari categorization (Kothari, 2004), this work falls into the Analytical, Applied, and Quantitative categories. Also, mixed research methods, which combine elements of qualitative and quantitative research approaches, are increasingly being accepted. Each type of research has its own strengths and weaknesses, and the use of the methodology must be justified by the objectives of the research.

### **3.2 Research Methods**

Qualitative research is a multimethod that focuses on involving an interpretive, naturalistic approach to its subject. This means that qualitative research gives the opportunity to examine things according to their natural settings, attempts to make sense of, or interpret, phenomena in terms of the meanings people bring to them. (Denzin & Lincoln, 1994)

Accordingly, to the definition above, a qualitative approach is a research strategy that usually emphasizes words rather than quantity in the collection and analysis of data

(Hammersley et al., 2013). The qualitative research methods enable the investigation of the research questions employing the defined theoretical concepts and frameworks. In this research, the use of qualitative methods is justified, since it is important to identify qualitative data, not quantitative data or statistics.

According to Kothari (2004), there are a variety of methods to collect data in qualitative research, including individual or group interviews, observations as well as textual or visual analysis for example from books and videos.

There are also various research methods to collect information, essential for designing the IA. A good summary of the various research methods is presented in Figure 13. Here we can see that some of the methods and activities to design the IA coincide or overlap with the traditional research methods of data collection.

Figure 13. Research methods and activities (Rosenfeld et al., 2015)

CONTEXT	Background research	Presentations and meetings	Stakeholder interviews	Technology assessment
CONTENT	Heuristic evaluation	Metadata and content analysis	Content mapping	Benchmarking
USERS	Search log and clickstream analysis	Use cases and personas	Contextual inquire	User interviews and user testing

However, the goal of the research is not only to use one of those methods but to find the best one that is appropriate exactly for that research purpose. Sometimes those methods could be combined together with some other methods or tools to provide a more comprehensive view of the users, content, and context.

Since the initial visions, needs, and requirements of different end-user groups of the DSH are quite broad and include many different actors with different motives, roles, and relationships, the **Service Design approach** also was used in the selected research methods. The Service Design methodology helps to plan and create IA of the digital platforms at different development stages. Service Design finds the balance between different requirements. In addition, Service Design methods are often associated with service wireframing or prototyping, which is also related to the aims of the current research.

In the **Service Design** approach, the researcher can use preliminary research and secondary research methods. The preliminary research is the researcher's own preparation before starting actual empirical research or fieldwork. The secondary research is the collection, synthesis, and summary of existing research. Both methods were used in the data collection process.

The **Double Diamond Model**, introduced in chapter 2.2.1, was utilised as a framework for the current research in order to cover the Discover, Define, and Develop phases. The model guided the creative process towards a proposal for the IA solution of DSH or platform.

Additionally to the tools that were described above, a **mind map** is one of the generally applicable Service Design tools for the first stage of concept design. The mind map allows us to put all the thoughts, concepts, and ideas around some topic and build a mental model of it in a visual way similar to a diagram. Mind mapping uses a nonlinear approach, so it can help visualize complex problems and explore the connections between the different components. Mind mapping was used in the current research to gather all general information about DSH and present it in a visual format, that allows identifying the functionalities of the platform.

Coming back to the qualitative research methods it is worth mentioning different types of interviews that were utilised in the research. An **in-depth interview** is a qualitative research method for conducting intensive individual interviews. The method is widely utilised in Service Design. In-depth interviews with relevant stakeholders (e.g., front- and backstage

employees, customers, suppliers, etc.) or external experts help to understand different perspectives on a specific subject. These interviews can advance learning about particular expectations, experiences, products, services, goods, operations, processes, concerns, and also about user's attitude, problems, needs, ideas, or environment. In-depth interviews are mostly done face-to-face allowing researchers to observe body language and to create a more intimate atmosphere but can also be conducted online or by telephone. In-depth interviews can be conducted in a structured, semi-structured, or unstructured manner. (Kothari, 2004)

**Structured interviews** are based on administered questionnaires, and are quick and easy to maintain. However, that interviews have some disadvantages such as limited participant responses and are, therefore, of little use in 'depth' questionnaires (Palmer, 2019). According to Palmer (2019), unstructured interviews do not reflect any initially defined theories or ideas.

**Unstructured interviews** are often very time-consuming, can be difficult to conduct and participate in, given the lack of pre-asked interview questions. Therefore, their use is quite rare, and usually, such interviews are used only in cases where significant "depth" is required or when practically nothing is known about the subject area.

An intermediate option between structured and unstructured interviews is the so-called **semi-structured interviews**. Such interviews consist of several key questions that need to be explored, but also give the respondent the opportunity to examine the answer to the question in more detail, or to provide their ideas. The flexibility of this approach, especially compared to structured interviews, allows the researcher to discover or develop information that is important to participants but may not have previously been considered appropriate by the researcher. (Palmer, 2019)

In-depth semi-structured interviews were chosen as the primary method for data collection from various representatives of target groups or end-users of the platform and create initial understanding, clarify the problems studied and the specifics of the platform. At the

empirical part of this research, the aims were to understand the general vision, needs, and motives of representatives of various target groups that are supposed to use the DSH platform and to develop a proposal for an IA solution with recommendations that are taken into account and the identified needs.

### **3.3 Research Design**

This research was divided into three phases, which are introduced in Table 2. The first Literature Review phase is focused on generating an initial conceptual framework, which underpins the empirical investigation to obtain the necessary information about the development and planning methods for a digital platform. Also at the very initial stage of the research, familiarization with the project documentation was carried out to identify the initial content and functional requirements of the platform.

In the Main study phase, an empirical study is carried out. It includes research using in-depth interviews with the project initiator and technical consultant as well as in-depth interviews with seven stakeholders and future end-users of the platform. At this phase also the analysis of the interview data is carried out using both classical analysis methods and Service Design methods.

The third phase, Applied study, practically combines the data obtained in the first and second stages. At this phase, several big blocks of the research were performed such as the introduction of tools for the Service Design, recommendations for the IA platform design, and development of the solutions for the platform IA. At this phase also practical deliverables such as Sitemap and Wireframing of DSH are developed. Table 2 represents all the phases of the current research.



Table 2. Phases of the research

<b>Phase 1 Literature review</b>	<b>Phase 2 Main study</b>	<b>Phase 3 Applied study</b>
Generating an initial conceptual framework, which underpins the empirical investigation	In-depth interviews (interviews with project initiator, technical consultant, seven stakeholders/end-users)  Interviews analysis: mind-map, SWOT. Building an understanding of the DSH platform requirements.	Designing a proposal and recommendations for Information Architecture solution, Sitemap, Wireframing

### 3.4 Data Collection

Data collection is started from the selection of the interviewees, who represent different target groups and stakeholders of the research case (Interreg BSR OSIRIS project) and end-users of the DSH collaborative platform. They were project partners, representatives of the public sector, researchers, private companies engaged in the development of the services and products for the Silver Economy. In order to develop the competent technical requirements, successful commissioning, as well as stable operation of the platform after the end of the project, the views of different target groups should be taken into account. It was necessary to collect information from different stakeholders relating to their aims of using the platform, basic platform functionality requirements, types of information to be posted, a platform working resources, etc.

Totally nine qualitative in-depth semi-structured interviews were conducted in this research. Among them, seven interviews were with those representatives of the target group who are directly involved in the project such as OSIRIS project partners (project initiator and leading project partner, technical project developer, seven project participants). Since the interviewees are from different countries of the Baltic Sea region, all interviews were conducted online. The interviews were done taking into account the principles of the Service Design. Interviews were recorded digitally with the permission of the respondents.

The interview with the initiator and the leading participant of the current project was carried out in order to understand the expectations of the main interested party and to build a complete picture of the collaborative platform. An interview with the technical development of the project was made to clarify the technical requirements, capabilities, and developer resources. Interviews with the project participants were conducted to understand stakeholders and their requirements. Data collection from other project participants was required to compile a final list of the functional and nonfunctional requirements. In this regard, the IA of the DSH collaborative platform is considered only taking into account the needs of the actual interview participants. A bigger number would probably enhance the reliability of the research, however, due to time constraints, it was not possible to implement.

The open-ended questions of the in-depth interviews allowed the interviewer to facilitate two-way communication and let the respondents express their views freely. In this case, interviews provide comparable and reliable data.

An interview guide was written in advance outlining the prerequisites for the DSH and preliminary questions. The interview guideline was sent to each of the interviewees for review in advance. Interviews were conducted in three languages: Finnish-speaking interviews were conducted in Finnish, with Russian-speaking interviews in Russian and with the rest in English. Interviews were implemented, documented, and transcribed during the autumn of 2019 and spring of 2020. Interview questions in English are presented in Appendix 2.

The interview structure consisted of three parts:

1. Introduction
2. The main part
3. Conclusion

The first part of the interview is the introduction. In the introduction, the interviewer explains the goals and objectives of the research in general and discusses organizational aspects such as the duration of the interview, the order of questions, etc. The interviewer also asks permission to use the recorder. The introduction started with simple “warm-up” questions regarding the interviewee’s organization and work in the project. The warm-up questions let the researcher start the interview gently and create a favorable atmosphere.

Then follows a second part of the interview, which is so-called the main. It is a transition to general questions about the DSH platform vision. Further, as the interview continues, the questions become deeper and lead to specific detailed levels, exploring functionality, features, content, and target groups of the platform. These questions are logically structured so that the questions that require the most intellectual stress are asked in the middle of the interview, and the easiest ones are closer to the end of the interview.

The third part of the interview is the conclusions. The interviewer summarizes the discussed information and clarifies with the respondent whether all issues and aspects were raised. It is important to verify it since the respondent's view of the topic may differ from the interviewer's view.

Generally, the interview duration is ranged from 40 minutes to an hour and a half. All interviews were conducted online personally by the researcher. With the permission of the respondents, interviews were recorded digitally (audio). The entries were transcribed by the researcher into text in Finnish, Russian and English. Records and full transcriptions of the interviews allow us to collect direct quotes that are used in the descriptions of the research results. Respondent names and firms are not specified for privacy reasons. Table 3 shows interviewed participants’ profiles.

Table 3. Interviewed participants profiles

Respondent N	Country of Baltic Sea region	Profile
1	Finland	project initiator
2	Finland	project technical consultant
3	Finland	business structure
4	Finland	government structure
5	Russia (St. Petersburg)	university/researcher
6	Russia (St. Petersburg)	university/government/incubator
7	Denmark	municipality
8	Denmark	university/researcher
9	Latvia	business sector

### 3.5 Data Analysis and Interpretation

In the process of analysing the quality data, various methods and approaches can be used. There is no one best way to do it. The analysing process depends on analysing data format (audio, video, photos, etc). One of the approaches for analysing and interpreting narrative data of in-depth interviews is thematic analysis. The five steps of the thematic content analysis was described by Taylor-Powell and Renner. According to Taylor-Powell & Renner, the analysing process includes understanding the data, focusing the analysis, categorising the information, identifying patterns and connections within and between categories, and interpreting. (Taylor-Powell & Renner, 2003)

Since this study examines the Service Design approaches, the researcher also examines possible methods for analysing qualitative data used in the Service Design. One of the used Service Design methods for quick structuring and analysing quality data is mind mapping. One of the advantages of the mind mapping approach is the fact that it better reflects natural thinking patterns that are non-linear (Burgess-Allen & Owen-Smith, 2010).

The Service Design mind mapping method is a simple and effective method to think through a problem and organize thoughts. It's a useful visual technique to introduce some structure to the process of analysing quality data. The mind-map diagram starts with the main idea in the center of a page, with subtopic thematical groups and cluster branches radially around the main idea. A mind map helps to organize notes or ideas to themes visually through topics and relationships. This allows to capture the full picture with one glance, and, if necessary, delve into the problem using other tools or methods. (Knight, 2020)

Service Design mind mapping approach was used for building initial 'themes' or 'thematic areas', which are related to key theoretical concepts of the research analysis.

The researcher started the analysis process by listening to all the records and making complete verbatim transcripts. At the same time, some notes were made such as observations, hypotheses, emerging patterns. During the analysing process, the researcher uses both - verbal and transcribed records simultaneously in order to gain a greater appreciation of the "non-verbal" part of the interviews.

Transcribed interviews were analysed in two analysis rounds. First-round brought up themes and keywords that were associated with platform vision, while all findings were summarised to themes in the mind-map. The mind-mapping process has started by putting a main theme (DSH collaborative platform) at the center of a blank surface and dividing information into 6 logical themes: general vision, target groups, functionality, content, opportunities/potential, and challenges. In the second round of analysis, the subcategories were discovered using the mind-map and further were utilised in the process of analysing qualitative data using themes in Excel tables. In the process of creating the mind-map, the researcher listened to the interview recording several times, reflecting on his field notes, each time making the necessary additions and corrections based on listening, more and more deepening and structuring information.

After that, prioritisation of the functionalities was conducted. Text responses of the respondents were added to the Excel file. Further, every DSH functionality, which was

mentioned by the respondent, was grouped to functionality themes. After entering the data received from the respondents into the table, all the points of every functionality were summarised. In that way, the list of the most and least demanded functions were obtained.

Thematic analysis, based on the Service Design mind-mapping approach, allowed the researcher to reach the most complete, deep, and objective analysis result of the qualitative data, obtained during the interview. The findings offer an overall overview of future stakeholders' and customers' needs, challenges, service ideas, and solutions for the DSH collaborative platform. The findings were organised and presented in the SWOT matrix. The results of the data analysis and interpretation were used to get a general picture and develop a basic concept of the IA of the platform.

## **4. RESEARCH RESULTS**

The current section discusses the findings of the interview analysis. First, it describes the service's general vision, then presents the platform strengths, opportunities, needs, and challenges, afterward overviews the functionality and content of the platform. At the end of the section, a summary of the key findings is provided. Additionally, this chapter integrates and discusses the research findings and defines phases towards building the IA proposal.

The main research aim is to contribute to the development of the DSH collaborative platform by way of providing structural and visual content and as a result of building an IA using Service Design methods.

### **4.1 Defining the DSH collaborative platform**

The researcher, using the Service Design approach and in-depth interviews was able to identify the main challenges and needs of stakeholders, as well as the strengths and weaknesses of the future platform. Using the mind-map tool for analysing the interview data, a complete picture of the DSH collaborative platform was compiled, including such

categories as general vision, strengths, and potential, challenges, target group, functionality, content.

#### 4.1.1 General Vision of the DSH

At the initial stage of the interview, the researcher after asking the general questions about the background of the respondents and the organizations they represent switched to the general vision of the future platform. At this stage, the researcher did not give any additional data, except the initial descriptive text of the DSH platform and the list of the platform's functionality. The aim was to give respondents the opportunity to dream without any directions or restrictions.

After that, the analysis of received data was conducted. The analysis revealed that potential users and stakeholders of the platform are strongly interested to get access to the DSH platform. However, the general vision of the future platform varies significantly among all representatives of the target groups. The difference can be brightly recognised in their answers such as:

*"The aim of the platform to specifically support the older population and their activities. That it's done as the backbone of Service Design methods, so that means that its primary use is the Silver Economy types, not us. It is very important that the tool is created to serve the older population. And it is precisely from the target group that it is to serve." (Respondent 1).*

*"This is a platform on the Internet that aggregates all the data that may be useful to participants, actors acting in the market with a focus on the older generation. ... I see that this platform is like a guarantee of building trust between the elderly and the companies. Creating a pool of reliable, trusted companies for different target groups - both for the elderly, and for government agencies, and among universities, suppose." (Respondent 2).*

*"I have a very floppy idea, what it is. I think it's a website, such an advanced web page to seek different kinds of information, connect to other information or people with the same*

*interest. Probably, there are all kinds of private companies, researchers and developers, municipalities and other organizations.” (Respondent 4).*

*“I realised that this platform will focus on a Silver Economy, and provide an opportunity to see this direction from different angles. I think it will be an interesting platform for business stakeholders. If there are certain business opportunities, financing mechanisms, meeting opportunities. It seems to me that this platform will be such an umbrella platform that will unite representatives of various areas of work with the elderly.” (Respondent 5)*

*“I would say that DSH platform could be a single-window system, that allows users to get sufficient information from one place. If I describe it in a few words.” (Respondent 6).*

The aforementioned statements clearly connote that the platform is considered as a large-scale platform with a large set of functionalities. The set of functionality that respondents mentioned, depends on the background of the respondent itself. Respondents clearly stated that they did not have any other additional information about the platform before the interview, with the exception of information sent by the researcher. This explains the varying perceptions of the platform among respondents.

#### **4.1.2 Opportunities and Challenges**

The strengths, weaknesses, opportunities, and threats of the DSH platform were analysed within the SWOT framework or matrix. This analysis is well known as SWOT analysis and stands for Strengths, Weaknesses, Opportunities, and Threats, and so a SWOT Analysis is a technique for assessing these four aspects of service. The section below discusses the findings of SWOT analysis.

##### **Strengths and Opportunities**

The main strength of the DSH, which stakeholders indicated is great potential and new opportunities for stakeholders and other users. Representatives of the business sector



recognised the great opportunities in the platform for expanding the export market. Representatives of the research sector are interested in networking and communication. Two public sector representatives could not clearly determine the benefits of the platform for the organizations they represent. The answers below represent those statements.

*“In a few years, such a platform may be in the right place and at the right time! Because, according to forecasts, this tendency to an aging population will continue, the concept of active and healthy aging will come and spread. All the same, people's attitudes to age will change. And, for example, 80 years now and after 10 years - I still want to believe that these are two different concepts. ... If now we think about whether there is such a need for this site, then we can rest on what realities we are in now. But if you apply and rely on the data that are predicted about aging, then in five years this platform can be very relevant, and if we occupy this niche, there is an advantage. Maybe similar platforms will be created by other organizations.”* (Respondent 2).

*“Of course, it should be useful. I think, with DSH platform companies will find a new market to sell products and services regarding the Silver Economy. For example, in small countries markets are too small, too narrow, so you have to export products and services abroad. DSH platform could be a good opportunity for this.”* (Respondent 4).

*“Of course, the platform will be useful to organizations such as ours. This opens up new opportunities for business development. A lot of a different kind of information provides opportunities for benchmarking and collaboration. It will probably be something new and interesting.”* (Respondent 5).

Two of the respondents such as government structure and university mentioned that using the platform is not relevant for the organizations they represent. However, along the platform vision design process, both respondents originally identified the platform as a platform designed for older people. However, at the exact moment, respondents do not see their organizations be representatives of the target groups of the project and, accordingly, cannot highlight the benefits for their organizations.

*"I'm not sure that this platform is necessary for our organization. Our organization has other platforms that we use." (Respondent 1).*

Most respondents emphasised the importance of the international European platform for collaboration, networking, and information exchange in the field of Silver Economy. Respondents said they would use the platform, look for the information and contacts.

*"For our organization, it is a very good tool to find new projects with different partners in different countries, academic institutions. So it is a good opportunity to get more experience in this field. Maybe it will be a benefit to using this platform for us in the future. Even in some collaborations, DSH may be useful. ... Maybe we can find some points where we can use it with our platform. For example, for us it is very important to get information from researchers and developers, who are producing hardware devices, so we could find some points." (Respondent 6).*

Some respondents also noted such possible benefits to save resources and time, using the platform for educational purposes:

*" I'll save a lot of time when using it. I will not use a lot of time to make networking. It's making my job easier. I'll have an easier access tool – this saves a lot of time." (Respondent 7).*

*"It might also be possible for educational purposes to involve some governmental organization, academic organization. Different lectures of some topics that can give an idea for a business, or researchers, or representatives of another target group." (Respondent 5).*

The above statements also suggest that stakeholders have various types of interests in different areas. According to stakeholder's opinions, the DSH is a potential service platform to provide the stakeholder's interests in the European Silver Economy field.

## Weaknesses and Threats

SWOT analysis on the other hand identified some problems that could adversely affect the possibility of using the DSH platform. Additionally, based on the analysis, the main potential critical weaknesses and challenges were found. Stakeholders pointed out the weaknesses and challenges mainly related to (a) the platform concept and benefits for users (b) the maintenance and update of the platform, and (c) marketing of the service.

The most challenging question for respondents was the question: what exactly the platform will represent and what kind of benefits portal users will receive. Respondents wanted to get a clear and precise idea about the concept:

*"In the first place, I would put the development of a clear concept so that everyone understands this" (Respondent 3)*

*"The processes should be clear for all. Companies don't have time, so they should know what benefits they can get from this platform. And this should be clear." (Respondent 4).*

*"And I think it will be really clear, then we start working on creating a hub platform, and we will see what we can give for that platform and what we can take. Is it a really beneficial platform for our company?" (Respondent 6).*

The second most exciting question for stakeholders was regarding the owner of the platform after the end of the project, and what resources will be allocated for this. This issue turned out to be a key issue for the stakeholders. Several respondents emphasised that it is not wise to unnecessarily overload the platform with functionality at the initial stage, but rather go along the path of MVP (Minimum Valuable Product) and conduct a more complete analysis of the needs and requirements of the stakeholders.

*"I think it is very important really to think about taking care of this platform and who will be doing this. Because we can now create a lot of functionalities, make very good architecture*

*for the platform, but somebody needs to maintain it, to look after the content. It is a very important step before making a big job. ... We really need to think in more detail about those questions. It is hard to say now about more functionalities. What is the plan – it is a very good idea. Few tasks need to be done before starting, about maintenance of this platform.”* (Respondent 6).

*“Now, probably, more questions than answers. What are the platform costs and resources for development and marketing? What about the platform maintenance, who will do it after the project ends?”* (Respondent 4).

*“Of course, there are questions - who will support this platform? At what expense will it be supported? These questions are also very relevant. But if you dream, then yes, it seems to me that everything will be beneficial. ”* (Respondent 2).

Some respondents also provided suggestions regarding platform management. These respondents were unanimous that the technical management of the platform should be centralised, but, nevertheless, each country should have its own responsible structure:

*“I think here is very important, that after the project it should be created like one department, who can administer that platform. Because, I think here we have at least 6 countries, who will upload this information. So I think it should be 1-2 representatives from each country. Because I think even the language issue will be here. I don’t know, is there the English language by default? It’s ok, but not all companies, I think, can upload equal quality content in one language – in English.... It is a very wide question because we need to know how it should be managed. And now deciding about this is very hard. I think some resources from each country should be and should have a responsibility for data maintaining.”* (Respondent 6).

*“Of course, the main questions I wanted to ask are the viability and reliability of the platform, and who is responsible for the platform support. It is possible that in Finland it could be Tilastokeskus (Statistics Finland) or some kind of large organization something like that.*

*There should be a clearly defined responsibility for supporting the platform. And it cannot be global since each country has its own specific rules. For example, legislation in different countries. Information concerning what is needed is also different. In order to be sure that the information on the platform is reliable, it is necessary that in each country a body is allocated with the authority to support the platform.” (Respondent 5).*

*“And as we talked, each country should be an administrator, so I think it also could be in each country, and information should go through that administrator. Because otherwise, we have some not useful information on the platform. Serious companies, who can be involved in this platform, cannot like it and leave it. So, the platform should be very high-level, high-quality. Should it be another project???” (Respondent 7)*

Despite the fact that the DSH platform created an interest to respondents, however not all the participants and organizations representing them are ready at this stage to allocate support and resources to update the information on the platform:

*“I think there is another big challenge. As a municipality, we will not pay for it and a big challenge to dedicate time and resources for this... It would be great if we will be more informative on the international level with the use of DSH. But still, it is a very big challenge, who will update this because it is very difficult to make people's work for free.” (Respondent 4).*

*“Before we can answer this question, we need to understand exactly why we need it, what do we want to get from this? It will also depend on how much resources will need to be allocated, how much we need to update and maintain information. Of course, there should be minimal resources.” (Respondent 3).*

*“So now it is very hard to say, because there is still one year further, and to see, what will happen after one year, is very hard. But if we see in our previous resources, I think that the moment we don't have resources on that.” (Respondent 6).*

The threats that were identified before related to the lack of information that respondents had about the platform. Presumably, respondents' caution in resources evaluation for the platform update relates to the lack of understanding of the number of required resources.

The stakeholders clearly pointed that it is crucial to add more content and value to the service before it can become a useful digital service and a communication platform in the Silver Economy field. Platform marketing should also be given special attention.

*“I think that there are big challenges for all companies and other users to find a new platform. We should think in advance how to get people to participate, to use a platform – how we will motivate companies? Also, we should think about the different processes for companies – how and which information they will use to the hub, or how they will link it to other platforms?”* (Respondent 4).

*“It should also be very strong marketing on this platform to let all these target groups know about it. It is also important to share all information in different countries. It is not enough that one person in Denmark, for example, will publish everything for different countries. There are different mentalities, specifics, in different countries, so it is very important to have representatives in each country.”* (Respondent 5).

The SWOT matrix includes four fields, where the strengths and weaknesses are both intersected with the opportunities and threats. Table 4 illustrates SWOT – analysis results.

Table 4. SWOT matrix of the DSH collaborative platform

STRENGTHS	WEAKNESS
<ul style="list-style-type: none"> <li>- financial and technical resources for the development of the platform</li> <li>- domain knowledge of the Silver Economy</li> <li>- ready ecosystem</li> <li>- stakeholders interested in the platform</li> <li>- quality product (platform)</li> </ul>	<ul style="list-style-type: none"> <li>- there is no understanding of resources and finances to maintain the platform</li> <li>- at this stage, it is impossible to understand the demand</li> <li>- strong dependence on users (as they form content)</li> </ul>

- opportunities for collaboration, networking, sharing information - pioneer advantage (new player)	- a large number of platforms around, it is difficult to make the desired unique platform
<b>OPPORTUNITIES</b>	<b>THREATS</b>
- great potential for development - no competitors - the exponential growth of the global Silver Economy Market - exponential growth due to the networking effect - opportunities to expand the platform	- hidden costs and resources (backup, problem-solving, and recovery) - security concerns (data security) - advancements in technology - the planned platform is new, and in the process of its development unforeseen cases may arise - the platform model can be copied by competitors

#### 4.1.3 Functionality

During the interview, the list with 14 items including the main functionality of the platform was presented to the users. This list was compiled during the planning phase of the OSIRIS project and is presented in Appendix 1. Users were asked to select the most and least useful features from the list. Functionalities were mentioned as most useful (1-3 function, marked by each respondent) got 2 points, and other functionalities that were mentioned got 1 point. Thus, the highest possible number of points per function could be 14 points. A complete list of the platform's functionality and points obtained are shown in Table 5.

Table 5. Most and less needed functionalities by stakeholder's opinion

Functionality	Most needed, points	Less needed, points
1) Profiles for scientists and R&D organizations	0	0
2) Profiles for companies	2	0
3) Profiles for local and national authorities	0	2
4) Profiles for RIS3 authorities (implementation, update, monitoring, and evaluation sections)	0	4
5) Profiles for end-users (citizens, patients, organizations)	0	6
6) Forum discussion panels	8	2
7) Partners searching & matching	6	0

8) Solutions searching & matching online chatting, newsletter	5	2
9) Documents sharing publishing options, resource center (open science)	8	2
10) Partnering network define the problem/add solution crowdsourcing	5	0
11) Cross-border living lab functionalities	2	4
12) Cross-border accelerator functionalities (programs, calls, innovation contest, applications, assessment)	5	0
13) Investment facility functionalities (programs, applications, calls, RFP)	4	2
14) Partner invitations through social media.	0	4

Based on the analysis, it is possible to say that respondents are mostly attracted by such platform functionalities as forum discussion panels, documents sharing publishing options, and resource center. Both functionalities scored the most points (8 out of a possible 14). However, it also received 2 points in the list of less useful features.

Identifying the least useful functionality was more difficult for respondents than determining the most useful. Two respondents could not answer the question. Thus, the highest possible number of points for each function in this analysis was 10 points. Respondents consider profiles for end-users (citizens, patients, organizations) to be the least useful functionality. This item scored 6 points, and not one of the respondents included this functionality in the list of the most useful.

The platform features such as cross-border living lab functionalities, profiles for RIS3 authorities, and partner invitations through social media are also included in the list of the least useful and scored 4 points each. Respondents wanted more information about the exact functionality that will be included in the cross-border living lab functionalities item. In addition, respondents identified such platform functionality as an events calendar. Four of seven respondents reported the need to create an event calendar.

Respondents also noted that the platform should be flexible and ready for changes:



*“The platform must be built flexibly, with the ability to change over time to meet various needs in a timely manner.” (Respondent 5).*

Separately, respondents mentioned non-functional platform requirements, such as usability, user-friendly, simple navigation, good-looking design, etc.

*“Usability with a wide variety of devices is always good to have. Again, with regard to digital literacy - the platform itself may have instructions on how to use it. In this case, special attention needs to be paid to it. Keep it as simple as possible. Not making it terribly complicated. Nowadays, good instructions, guides, perspectives on how to produce such user-friendly and plain language instructions, and more. These should all be taken into account as well as possible.” (Respondent 1).*

*“As I said earlier, the platform must be reliable, fast, flexible, easy to navigate, and contain valid information. It should be visually good looking Easy to use for the end-users platform. Certain rules for using the platform must exist (who can register, what information to publish, etc.). How can we be sure that these rules are respected? Who will control it?” (Respondent 5).*

#### **4.1.4 Content**

Regarding the content, the opinions of the respondents were quite similar. According to the respondents, the platform should support all modern content formats - photos, videos, pdf, and other file formats.

*“All possible types of content are good. It should be clear and well structured. Then we have a huge amount of information, we should have strong possibilities to find the information we need at this moment. But it is also important that each platform user can decide how much information it could publish and then.” (Respondent 4).*

*“Education articles, videos, photos to make a hub alive, to show that there are interesting things going on. People will use this platform through videos, photos, and other activities. It should be part of it.”* (Respondent 7).

Most respondents believe that part of the information should be available only after the user has registered on the site.

*“It could be relevant to make some kind of filter. Maybe it should be only information, which is relevant only for some users. I am not sure about that. It should be a consideration. Probably, it will depend on what the user type is. I like the idea of a totally open platform.”* (Respondent 7).

*“I believe that some should be open, and some should not. For example, with regard to companies and government agencies - I think that there will be some kind of information sector that should not be open to end-users. But, at the same time, if the site is completely closed, we can scare them away. All the same, there should be an opportunity where you can familiarize yourself with entering this information field. And, for example, choose a company for yourself.”* (Respondent 2).

Also, three out of seven respondents believe that the site should have informal structure, for example, in the form of a blog, or structure like a social network:

*“Blog should be for the whole platform in general, not just for one or each company. Because then it will be very hard to find information at thousands of companies, and to find in each company blog is difficult. Of course, if there is only one platform blog – there will be a huge amount of information, so the search function should be made precise.”* (Respondent 6).

*“Maybe it would be a good idea like Facebook, for example, maybe you can follow some companies, and, for example, maybe you want to get only from some companies information, what they are doing. And maybe there could be a button to “Follow” for the company, and you will get only those companies’ information.”* (Respondent 6).

Four out of seven respondents said that price-lists of the business companies would be irrelevant content, since in this high-tech and rapidly developing field it is often impossible to provide them, and price-lists of different companies cannot be compared with each other.

#### **4.1.5 Summary of the Findings**

Stakeholders were able to identify the main challenges and opportunities of the new DSH collaborative platform. Together with suggestions from the literature review, it gives the basis for designing an IA concept for DSH collaborative platform.

Further, all respondents are interested in creating such a platform and believe that building such a platform is relevant and timely. Most respondents believe that the platform will bring value to the organizations they represent, and using the platform will bring certain benefits. Among the possible benefits, respondents identified collaboration, networking, and information exchange. Nevertheless, a clear definition of benefits is currently in doubt, since the clear concept of the platform is still not clear.

Also, respondents clearly identified the challenges that are visible at this stage. The biggest challenges are related to (a) a platform concept and benefits for users, (b) maintenance and the platform update, (c) marketing of the service. Especially respondents are concerned about the issue of the resources, in terms of, who will do maintenance and updating of the platform. Respondents also offered their solutions. Perhaps, for this reason, the respondents were cautious in answering the question about the allocation of resources to support the platform in the future.

Questions about the functionality of the platform were somewhat difficult for some respondents. However, in the process of analysis, the following most demanded functions were highlighted: forum discussion panels, documents sharing publishing options, and resource center. Respondents considered profiles for end-users, cross-border living lab

functionalities, profiles for RIS3 authorities, and partner invitations through social media the least requested features.

Questions about the platform's content, apparently, were too detailed at this level, which also caused some difficulties for some respondents. Respondents agreed that the platform should be as open as possible, and only a small part of the information should be accessible after registration. Also, the communication functions of the platform should be available only after registration. Respondents believe that the platform should support all modern content formats, including interactive content. Respondents were ready to offer their ideas and participate in the further development of the DSH.

The next section describes the decisions of the IA, which are based on literature review and main study analysis results.

## **4.2 Building the IA for the DSH collaborative platform**

This research utilise the Double Diamond tool ended up focusing on only the 'Discover', 'Define', and 'Develop' phases, touching only briefly the preliminary ideation of the 'Deliver' phase."

All findings obtained at the previous research phase were used at the applied study phase. Going to the next phase, the researcher had a fairly complete picture of the functional and nonfunctional requirements. The purpose of the applied study phase was to develop one of the possible options for the DSH collaborative platform IA, including wireframing of the main page. At the applied study stage, specific tools and methods for working on the IA of the digital collaborative platform were studied and put into practice. As a result, this phase consists of a basic concept proposal and visual outcomes for designing an IA for the DSH platform.

The Service Design approach is utilised to build the IA for the DSH platform with a focus on the end-users involvement in this development process.

At the initial stage of the platform development, the Double Diamond method was used as one of the main methods for the Service Design. This tool suits more since the expectations, needs, and requirements of stakeholders, and, accordingly, various user groups, differ greatly at this stage of the project, which corresponds to the stage "**Discover**" of the Double Diamond method.

In the next "**Define**" stage, the task is, on the contrary, to reduce massive opportunities, and create a clear brief, identify some to take forward, and analyze. Additionally there it is important to report the findings from the 'Discovery' phase in an easy to grasp and clearly communicated format, to provide the understanding, to build empathy, to support the decision making concerning the main challenge and opportunity areas, to provide concrete directions, to support for further development, to visualize and represent the lightweight and structured data. All those tasks were done by the way of creating a mind map.

As part of the applied work, data obtained in the previous stages were used to describe the concept, as well as to plan and create visual outcomes. The objective of this stage was to describe the basic concepts for the approach to planning the IA of a future project and the creation of visual artifacts.

The applied research phase is the final stage of the research, corresponding to the "**Develop**" stage of the Double Diamond method. At the "**Develop**" stage, a prototype of the service was developed. In our case, these are wireframes of various pages, as well as a sitemap. Visual outcomes (or IA artifacts) of IA include organizational, navigation, labeling, and searching-systems. Based on the wireframe it is possible to build an interactive prototype of the platform and test it on the target audience.

In the "**Develop**" phase the researcher used such visualization tools as Axure, Goconqr, Cocoo. With the help of those applications, a mind-map of the platform, sitemap proposal, and home page wireframe was created. All outcomes can be used for further work on the project, as the initial proposal of the IA of the DSH collaborative platform.

The final “**Deliver**” stage included the work of creating and testing the platform. This stage of Double Diamond method wasn’t the part of this research. For testing purposes, it is recommended to invite some representatives of the target audience and observe how they manage to reach certain pages or results within the site. Users can be also interviewed regarding the site in general.

The organization system is the basis for the entire IA, therefore the work on it must be given special attention. The inclusion of all the necessary elements in the navigation system, at the same time, without overloading it, is a rather difficult task for large-scale platforms. To build a convenient navigation system and user engagement is also recommended.

Respondents emphasised the importance of a convenient and efficient search system, so special attention should be paid to search engine planning. Since this is one of the key findings, it is important that the planning work for the search system is carried out jointly with users.

Since stakeholders and future users are from different countries, it is necessary to pay great attention to the terminology used on the platform. For example, in different countries, different terms are used to define an elderly person - "older people", "senior", etc. It is important to select and coordinate terminology with stakeholders before the construction stage of the labeling system of IA.

Another important key finding is launching a Minimum Viable Product (MVP). For MVP, it may be enough to take 20% of the planned functionality and invest up to 60% of the budget in its launch.

Identifying the needs and requirements of stakeholders, involving them in the process of planning a product or service from the very beginning, increases their loyalty to a future product or service, avoids possible errors, takes into account the maximum number of ideas, and creates an effective service that will be in demand.



#### 4.2.2 Sitemap

Content categorization is an important first step in planning an organizational system of IA and website structuring. The Mind map obtained in the previous step facilitates the work of structuring.

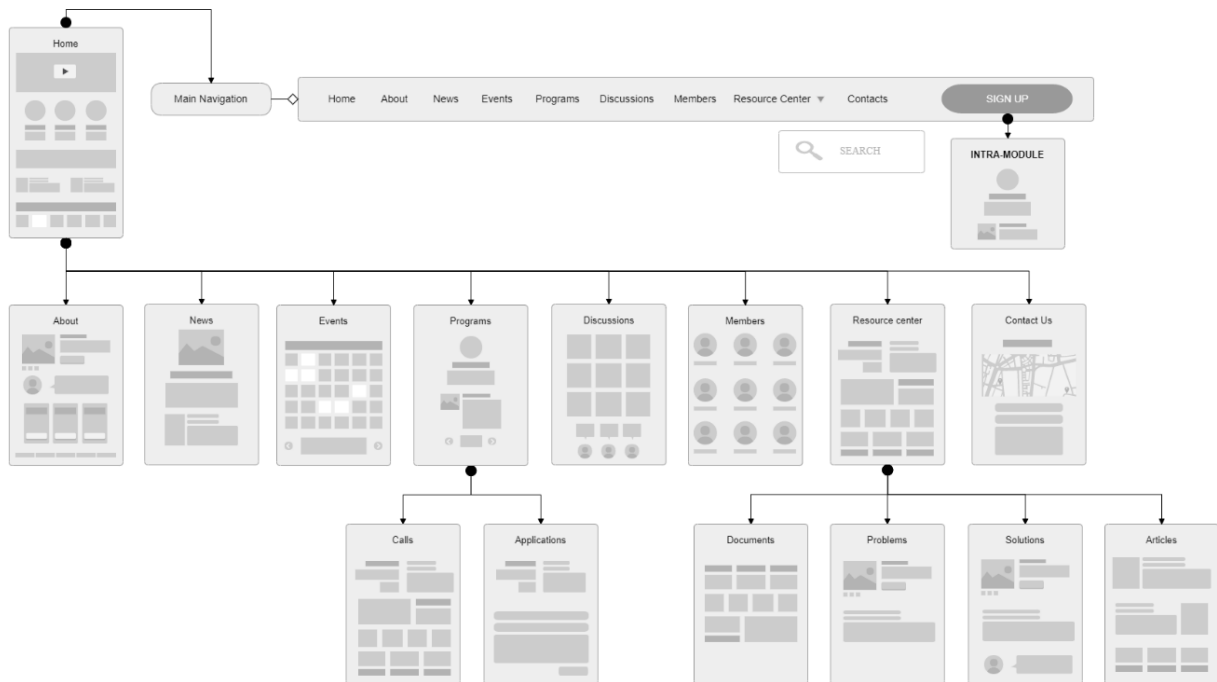
The exact definition of all categories at the initial stage is impossible. The categorization process is iterative, because there is a constant definition and verification of criteria and details and movement between macro and micro representations of content. Categories should be informative for users. Switching to the sitemap creation phase, the researcher already completed the research and discovery work that provides answers to the questions about users and their needs.

The challenge at this stage of the research is that the platform users cover different target groups, and each target group has different tasks, different needs, and different expectations of the content. In such cases, architects consider the possibility of categorising content by target groups or audience. However, audience-based navigation is rarely the right solution. A more appropriate approach is to focus on users' actions, rather than their personas.

In order to create an effective categorization, the architect should also include a post-launch content management work, thus it should also be considered. The researcher is able to recommend ways to categorize content by creating a sitemap after having assessed the needs of stakeholders, the requirements, and future goals of the content. The sitemap includes the main menu, as well as the structure of the site. To create a sitemap, the researcher used the Cocoo sitemap online tool, which allowed to create a modern sitemap that also included a schematic detailing of the destination pages. The sitemap presents the complete information hierarchy from the main page to the destination pages, including details of the labeling and navigation systems. Figure 15 illustrates one of the possible designs of the sitemap of the future platform.



Figure 15. The sitemap of the future DSH collaborative platform (front-end)



### 4.2.3 Wireframing

IA method called Wireframing was used in this applied study phase. Wireframe of the main page of the DSH collaborative platform was developed. The wireframe displays the general interface, layout, functionality of the page and the location of the content. The color style, graphics, or any other design elements are not taken into account at the stage of creating a wireframe.

At this phase, one of the most common software's tool for creating interactive wireframes, Axure, was used. Wireframe shows organization, navigation and labeling systems of the main page. All data received from the previous research phases was used in the wireframing development process.

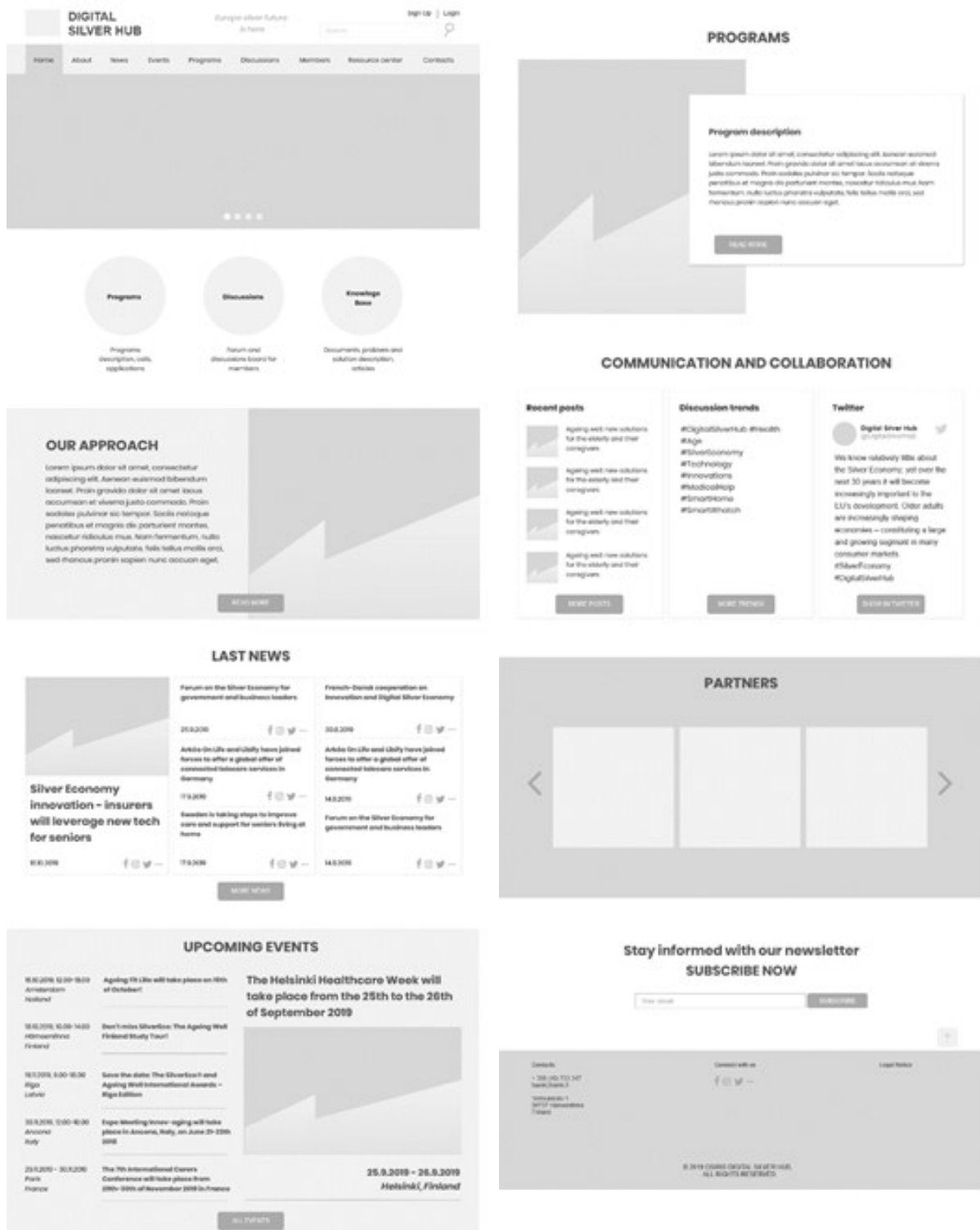
The header section of the main page (and probably of other pages) contains these items:

- Website logo and name
- The primary navigation menu
- Login/Sign-in form
- Search form
- Image- or video slider section

The contextual areas of the main page were designed after designing the header section. The contextual areas are different for each page. The contextual area starts with three navigation items, which are more important for the user, therefore are highlighted separately and placed at the beginning of the main page. Highlighted items are Programs, Discussions, and Knowledge Base. After that follows the information block with an explanation of the platform goals. Below are the main content blocks, which are Last News, Upcoming Events, Programs, Communication, and Collaboration. At the end of the contextual area are Partners image-slider and Newsletter subscribing form. Website footer shows contacts, links to social media, and the Legal Notice link.

The wireframe structure of the main page of the DSH is illustrated on Figure 16. Based on this wireframe it is possible to create an interactive prototype of the platform in Axure.

Figure 16. Wireframe of the main page of the DSH collaborative platform



## 5. CONCLUSIONS

The main objective of the research was to analyse how the Service Design methods can be in practice integrated into the Information Architecture (IA) development process for the Digital Silver Hub (DSH) collaborative platform.

The theoretical framework for this study was constructed based on a literature review, which includes discussions on the relevant theories and past research findings regarding the development of digital platform Information Architecture and human-centred design logic. Empirical research consisted of two parts: main study and applied study. The objectives of main study were to identify the challenges and needs of stakeholders, as well as the strengths and weaknesses of the future platform, in order to build a complete picture of the functional and non-functional requirements of the DSH collaboration platform.

Semi-structured in-depth interviews were the primary method of data collection of the main part of the study. Interviews were conducted with project and communication managers and with technical consultant of the Interreg BSR OSIRIS project as well as with seven stakeholders and future end-users of the platform.

The analysis of the interview data was carried out using thematic analysis based on Service Design mind mapping approach and SWOT methods. The mind mapping approach helped organize and structure the data into themes and provided a visual format for representing the key themes raised during the interviews. The provided SWOT analysis helped to identify and present the main threats and opportunities of DSH collaborative platform, which should allow to minimise the identified risks, as well as to use the opportunities to build a digital platform that is convenient for the end user.

According to respondents, as the possible benefits of the DSH collaborative platform are collaboration, networking, and information exchange. Respondents identified, that the biggest challenges are related to (a) a platform concept and benefits for users, (b) maintenance and the platform update, (c) marketing of the service.

The analysis of the interview data showed that building a logical, convenient, understandable IA, requires a lot of preliminary work and analysis of the received data, including empirical data from stakeholders of the future collaborative platform. Based on the analysis results, an initial understanding of the DSH platform requirements was built.

Based on the main study findings, it was recommended to use an iterative and end-users involving approach at each stage of the DSH development process to improve communication with stakeholders, as well as to use the set of tools that is most suitable for the tasks of the current stage, for the purposes of making the best possible proposal of design of the DSH.

The focus of the applied part of the research was to determine the possibilities of using and integrating the Service Design approach and methods in the development of IA, as well as the practical application and development of artifacts and visual outcomes. The research findings from main study were utilised in the applied part of the research. Going to this phase, the researcher had a fairly complete picture of the functional and nonfunctional requirements.

The Service Design Double Diamond method was utilised to build the IA for the DSH platform with a focus on the end-users involvement in the development process. The use of the Double Diamond method was justified because the expectations, needs and requirements of stakeholders and, accordingly, of different groups of users differ greatly at this stage of the project, which corresponds to the "Discover" stage of the Double Diamond method.

As part of the applied study, specific tools and methods for designing the IA were studied and putted into practice. A label systems for organising, navigating and marking the DSH was developed. A proposal and recommendations for IA of the DSH collaborative platform were made utilising visual outputs (artifacts), such as DSH sitemap and main page wireframing. These visual artifacts can be used as a starting point in the further work on the development of the DSH platform.

The results of this research revealed the importance of the end-users' involvement in the development process at all design stages. User-centered design provided important methods and tools and contributed to the holistic approach for developing an IA of the DSH platform. The user cannot be involved in the process only from the consumer point of view, but also as a transfer of responsibilities for the joint creation of a quality product. Based on the experiences from the research process, the researcher can emphasize the importance working together with stakeholders, flexible and iterative work.

As a final conclusion of the study, it can be stated that Service Design methods can be successfully and effectively used in the process of the development of the IA of a digital platform.

## **5.1 Trustworthiness of the Research**

Lincoln and Guba (1985) use the terms credibility, transferability, dependability, and confirmability for trustworthiness of the research. It is important to carefully check the trustworthiness of every step of the research process, including the preparation, organization and reporting of results. These criteria have been chosen to meet the methodological position of this study on every step.

### **Credibility**

The basis of any claim to trustworthy knowledge is credibility. Credibility is the extent to which the findings of a qualitative research study are internally valid (i.e., accurate). (Lincoln & Guba, 1985)

In this study, credibility on different research phases was achieved by selecting the most appropriate method of data collection (in-depth semi-structured interviews), by obtaining data from various sources, and therefore it was ensured that potentially based points of view were not detected in a single respondent. All interviews' digital audio-records were transcribed and examined carefully by the researcher.

**Transferability**

Transferability is primarily established through thick description that is “necessary to enable someone interested in making a transfer to reach a conclusion about whether transfer can be contemplated as a possibility”. It involves providing readers with a thick description of the findings and their context that is sufficiently detailed. This allows readers to assess the fit of the findings or part of the findings to the context they are focusing on. (Lincoln & Guba, 1985)

Interviews, that were conducted in the course of the research with different respondents’ groups from different countries, allow going beyond the boundaries of a particular country and industry. The findings from the interviews are detailed in the report, and may be applicable in other contexts. In addition, the researcher tried to make the description of the results rich enough to readers to hear individual voices. To this end, numerous interview excerpts have been used to illustrate contextual information. Thus, a rigorous description of the empirical results can help to transfer them to other contexts.

The proposed conceptual frameworks, visual outputs and other deliverables are not industry or country specific and can be justified in any industrial and cultural context.

**Dependability**

Dependability can be compared to reliability and refers to the question as to: "How can one determine whether the findings of an inquiry would be repeated if the inquiry were replicated with the same (or similar) subjects (respondents) in the same (or similar) context?". However, this question has much less sense in qualitative research, which generally assumes that there is no single objective reality ‘out there’ to be discovered. (Lincoln & Guba, 1985)

This study uses real settings and contexts that inevitably change, and therefore, accurate replication is not achievable. Nonetheless, the research process is logical, traceable and documented clearly. The researcher documented in detail the choices of the research

methodology and methods of data collection, and established coherent linkages between the data and report findings.

### **Confirmability**

The confirmability criterion is necessary to assess the quality of the process whereby research data were produced. Confirmability refers to the aspect of neutrality and can be characterised by the degree to which the results of a study can be confirmed by other researchers. Confirmability is concerned with establishing that data and interpretations of the findings are not figments of the inquirer's imagination, but clearly derived from the data. (Lincoln & Guba, 1985)

In order to establish the confirmability in this study, the research plan and research process provided a detailed description of general methods and procedures used in the study, ensuring transparency in the collection and analysis of data. The researcher provided descriptive characteristics of the respondents, methods and techniques used in the research. In addition, the researcher simplified the presentation of the data by structuring the data collected through interviews in different tables. It also contributed to the transparency of the review process.

## **5.2 Limitations**

Usually, every single research has some limitations along the process. That is why it is necessary to recognize some of the methodological limitations of the research. This research is carried out in the context of a collaboration between European organizations and companies working in the Silver Economy field and related industries.

However, interviews were conducted with only a limited set of respondents, who are not always familiar with the work of the OSIRIS project and the planned digital platform. Moreover, these respondents were not always able to express clearly the general views of the organization they represented, but mostly were limited only by their personal views on the future digital platform.



In the process of collecting information, it was found out that potential users of the platform, partners of the OSIRIS project as well as innovation actors of regional Silver Economy ecosystems, have very different ideas about the future platform. Someone considers the platform as an information platform for the elderly, someone as a platform, where anyone can find a provider of digital services and products for the elderly. Some see this platform as a platform for cooperation and exchange of the experience in the field of Silver Economy innovations in different countries, etc.

The lack of interviews with the management of companies and organizations that have the right to make decisions made it difficult to obtain the full necessary information.

### **5.3 Suggestions for Further Research**

The world is changing rapidly, and traditional models and approaches are undergoing major changes. There is a significant increase in knowledge and competencies. Their growth opens up new approaches to the development of products and services. New areas of the design and science are emerging that help to consider planned services from various points of view, using the most effective and suitable approaches. This applies not only to IT and the digital sphere but also to other areas. A flexible and iterative approach of co-creation is crucial. Because it suits the trends of modern times and allows to create popular products and services that meet user expectations and respond flexibly to market changes and needs.

The limitations mentioned above open the door for further research that may yield more accurate results. It is recommended that in the future the study could be conducted with the aim of studying the views of all stakeholders and analysing possible differences between their perceptions. Interviews with leaders of companies or organizations (or project areas) can add valuable first-hand information to the research questions.

It is strongly recommended to pay serious attention to the involvement of all stakeholders to the design and development process of the digital platform. To achieve the best result,

iterative involvement of potential users at all phases of the digital platform design process is necessary in order to receive valuable ideas and feedback. Collaboration using the Service Design methodology allows finding the best solutions. However, it was revealed that without collaboration with Service Design, may lead to the negative result, when the developed platform has a chance of becoming unclaimed, despite the large resources invested in development. Collaboration also includes transparency and accessibility for the communication through the established channels.

The success of any digital service or product greatly depends on the user's experience, new knowledge, technologies and methodologies. Nowadays, without using the Service Design methodology or other methodologies for involving users in the process, it is very difficult or almost impossible to design a modern digital service. Tools and practices of the Service Design are closely intertwined with other disciplines used in the planning of digital platforms.

A product or digital service must be planned in such a way that it has a potential and possibility for development along the changing trends in a digital or business environment. The product should not be regarded as the final result, but always only as an intermediate result that can be improved.

I would like to finish this work with a quote from a practitioner's handbook "This Is Service Design Doing" published by Marc Stickdorn, Markus Edgar Hormess and Adam Lawrence in 2018. The following few words reflect the concept of developing any service or product:

**"Make sure you are solving the right problem before solving the problem right."**

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## **APPENDIX 1. INITIAL DESCRIPTION AND FUNCTIONAL REQUIREMENTS OF THE PLATFORM**

Digital Silver Hub (DSH) is a virtual collaborative platform that will integrate networked Smart Silver Labs operations, transnational accelerator functionalities and financial mechanism functionalities in order to facilitate commercialization of innovative products or services developed using the smart silver framework.

The main features of collaborative platform are:

- 1) Profiles for scientists and R&D organizations;
- 2) Profiles for companies;
- 3) Profiles for local and national authorities;
- 4) Profiles for RIS3 authorities; RIS3 profile (implementation, update, monitoring and evaluation sections)
- 5) Profiles for end-users (citizens, patients, organizations);
- 6) Forum; discussion panels;
- 7) Partners searching & matching;
- 8) Solutions searching & matching; online chatting, newsletter;
- 9) Documents sharing; publishing options, resource centre (open science);
- 10) Partnering network; define problem/and solution; crowdsourcing;
- 11) Cross-border living lab functionalities;
- 12) Cross-border accelerator functionalities (programs, calls, innovation contest, applications, assessment);
- 13) Investment facility functionalities (programs, applications, calls, RFP);
- 14) Partner invitations through social media.

## **APPENDIX 2. KEY INTERVIEW QUESTIONS**

### **Project Overview**

1. Who do you represent (project initiator, technical project developer, project participant)?
2. What are the goals and expected outcomes of this project (Digital Silver Hub), and how you envision the end result of the project (goals and outcomes should be
3. What resources do you have for updating and maintaining the site (during the project / after the end of the project)?

### **Target Groups**

4. Who is the portal's target audience? Who's going to use this portal? Describe different target groups, geolocation, gender, professions, etc., and also potential number of users in each group.
5. Target group problems. Determine concrete problems of these target groups (differently for each group), which could be resolved with the use of Digital Silver Hub.
6. Target groups goals. Determine concrete goals of these target groups (differently for each group), which could be achieved with the use of Digital Silver Hub.
7. How might target groups benefit from the site? Describe which functions of Digital Silver Hub will be a solution for the target groups problems.

### **Users**

8. In your opinion, which user groups should be on the site?
9. Which user groups do you think can be combined? Is it possible to reduce the number of user groups?
10. Will users have to register on your site? If so, which user groups and for what purpose?

### **Features (take a look for a list of features from the project description before answer next questions)**

11. What are the 3-5 most important functions that should be on the portal?
12. Name the 3 -5 least important functions for the site portal.
13. What are the 1-3 main target groups of the portal, which must be able to post and edit content?
14. Do you have additional ideas or comments on the platform functionality?



**Content**

15. What content is planned to be placed on the portal (price lists, descriptions of the organization's activities, educational articles, videos, photos, pdf, other)
16. What information must be on the main page?
17. What information should be visible at all times?
18. What features, sections of information do you want to emphasize on the site?
19. Should the site contain information accessible only to registered user groups? If so, what kind of information and for which user groups should be available only at the entrance to the system?

**Other**

20. Does the site need different language versions?
21. Should site have a mobile device optimization (so your website looks good on mobile devices)
22. Do you have additional information, ideas, comments that will be useful for developing an architectural solution and were not covered in this interview?

## APPENDIX 3. MIND-MAP (text version)

### DIGITAL SILVER HUB

1. TARGET GROUPS
  1. Researches
    1. Finding new research topics
    2. Promote utilisation of research results
  2. Universities
    1. Promoting/development of a a new educational programs
    2. Collaboration with other universities
  3. End-users: citizens, patients, organizations
    1. Receiving information
    2. Products and service search
  4. Companies, start-ups
    1. New technologies promoting
    2. Needs from the market
    3. Price lists
  5. Local and national authorities
    1. Meet municipalities from other countries
    2. Laws, regulirations
    3. Financing mechanisms
  6. RIS3 Authorities
    1. Database with all technologies that can help with such kind of problems
2. FUNCTIONALITY
  1. Profiles
    1. Posting, commenting, sharing information
    2. Profile description
    3. Like a Facebook
  2. Programs, events, calls
    1. Programs and event descriptions
    2. Event calendar
  3. Collaboration
    1. Discussions boards, forum
    2. Private conversations
    3. Fast sharing documents between users
  4. Partners searching, matching
    1. Advanced search filters
  5. Publishing
    1. Resource center / archive
    2. Upload / download documents, images, videos
    3. News
    4. Blog
  6. Crowdsourcing
    1. Feedbacks
  7. Partner invitations through social media
3. GENERAL VISION
  1. The purpose of the platform: to unite and provide the necessary opportunities for the work of partners and other innovative figures in the region, and not only in the region, but also transnational
  2. Non-functional requirements

1. User-friendly, modern
  2. Sustainable, fast
  3. Constant updates
  4. Flexible, adaptable for changes
  5. Practical and pragmatic
  6. Working on different platforms
  7. Accessible for visually impaired
  8. Simple
3. Support the older population and their activities
  4. Platform on the Internet that aggregates all the data that may be useful to participants, actors acting in the market with a focus on the older generation.
  5. Creating a pool of reliable, trusted companies for different target groups - both for the elderly, and for government agencies, and among universities
  6. Umbrella platform that will unite representatives of various areas of work with the elderly
  7. A single-window system, that allows user to get sufficient information from one place
  8. The platform should be very high-level, high-quality. Should it be another project?
4. OPPORTUNITIES / POTENTIAL
1. Make Silver Economy market potential visible
  2. Partners searching/matching
  3. New technologies and ideas
  4. Research of others need and technologies
  5. Co-creation of new products, services, projects
  6. Increased trust between participants
  7. Combining contact, design and research information
  8. Digital Silver Hubs for different regions/countries with using of the same technical design of the platform
  9. Find a new market to sell products and services regarded to Silver Economy
  10. Opportunities for collaboration, networking, sharing information
  11. Pioneer advantage (new player)
5. CHALLENGES
1. How to motivate users to co-creating materials?
  2. Big challenges with updating and maintaining the site
  3. What are the marketing needs?
  4. Is it possible to cooperate with other projects ?
  5. Maintenance, functionality and resources balance
  6. Possibilities for paid marketing for companies?
  7. Identifying the priorities
  8. One more platform, no resources to use it without deep understanding of benefits
  9. A clear concept so that everyone understands this
  10. Viability and reliability of the platform
  11. A big challenge for all companies and other users to find a new platform. How to get people to participate, how we will motivate?
  12. Hidden costs and resources
6. CONTENT
1. Blog: posts, articles from members
  2. Media: videos, images
  3. Documents
  4. Programs descriptions
  5. Comments, feedbacks
  6. Official news
  7. Links
  8. Open and private content
  9. Researches
  10. Very practic