**Redesigning website navigation from content-based to task-based:
a case study for Nuage website**

Pan Pan

University of Tampere
School of Information Sciences
Interactive Technology
Pan Pan: Redesigning website navigation from content-based to task-based: a case study for Nuage website
M.Sc. thesis, 60 pages, 6 index and appendix pages
June 2015

Abstract

Modern web technology has brought information two clicks away from web users. A web-based application is capable of accomplishing as many complicated tasks as a desktop application. The website navigation system plays a crucial role in how efficient users are able to allocate the information and accomplish tasks using a website. This thesis describes an experimental project, in which I redesigned a website navigation system from content-based to task-based in order to improve its usability. The target website is called Nuage, a web application developed and used internally by Nokia.

In this thesis, I first describe the theory behind the website navigation, the information architecture and the website redesign process. Then I analyze the current Nuage website user interface and explain the subsequent redesigning of its navigation system. Finally, on the basis of a usability test I evaluate whether this navigation system can be more productive and bring more business value.

The usability test result shows the change in the navigation system has different levels of impact on different groups of users. The task-based navigation shows significant improve in the learnability and efficiency within limited changes in the website. The content-based navigation is, on the other hand, more logical and presents a big picture of the website structure.

My experiment shows the task-based navigation generally works better in the Nuage website by providing direct access to the actions and quick feedback on the completions of tasks.

Key words and terms: website navigation, website redesign, task-based navigation, information architecture, intranet, usability test

Table of Contents

1   Introduction

Since the first introduction of the "web application" concept in 1999, the number of applications built on the website has been booming. Now 15 years after, along with the development of web technology, tools and applications using websites as their platforms rather than the traditional desktop are very common. The benefit is obvious: the web-based application does not require an installation and can be run on any device that has a browser. These kinds of applications look and work the same as websites, with which users interact by using links, buttons, and other web elements. However, the website application is more complex than the traditional website because users need to navigate a huge amount of information, manipulate data and accomplish many different types of tasks. Therefore, it is a question of how to design a website application with good usability so that users can use it easily and efficiently. One of the key components which affects the usability of a website is its navigation system.

Website navigation is one of the most critical components of a website. As the navigation system is the first experience of the user who interacts with a website, it plays an important role in building user experience. A successful navigation leads to a successful website, and vice versa: no website will succeed with a poorly design navigation system. A well-designed navigation is practically invisible because users can navigate so naturally that they cannot feel its existence. It makes finding information easy, enhances the reliability of the website and ultimately improves the quality of the product that the website represents. A good navigation system encourages the user to explore the website without worrying about getting lost and ensures the user's work process runs fluently and naturally.

Kalbach (Kalbach, 2007, p5) defined web navigation as:

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

The definition explains that a website navigation as a part of user interface, is a collection of multiple web elements, most of which are links to pages. The goal of the website navigation is to help users allocate the information, perform actions or browse.

Moreover, Kalbach (Kalbach, 2007) and Eugene (W.Eugene & Technologies, 1999) emphasize the fundamental questions a website navigation should be able to answer to the user: Where am I? How can I get here? How do I go back? In order to be able to answer the questions, the following aspects must be considered when making design decisions regarding the elements used in a website navigation: the priority of usage, place and style. Building a good website

navigation is not an easy job. It is a task involving cooperation between multiple groups of people with different techniques: information architecture for shaping information, navigation design for linking information by relationships, visual design for shaping the appearances and last but not least usability engineering for helping users complete their tasks easily.

Websites serve different business goals; for example, the main purpose for informative websites such as BBC.com is to deliver information, for commercial websites such as Amazon.com it is to sell and promote products. Therefore, the navigation system varies in types and styles to provide better support to achieve the business goals for each kind of website.

Websites that provide information usually categorize the information by its content, and the web navigation system built upon the categorized information is called a content-based navigation. Content-based navigation can help the user find information from the name of the groups or the categories which shown as the navigation elements. In contrast, on some websites the information is provided according to the user's action, which requires the user to do some tasks first. The main purpose of these kinds of website is to support users to perform tasks. In this case, content-based navigation is not intuitive enough for users to start actions quickly, so a task-based navigation system is used instead. Web-based applications are one example of websites whose main purpose is to allow users to perform tasks. Nuage is such a web application, which is used to create and manage the configuration settings for mobile phones. As described above, many suggest using task-based navigation in a web application (CHI, 2004; White, 2014).

However, there are still open questions, for example: is task-based navigation really a better choice for a web application? How much benefit does task-based navigation bring to a web application compared to content-based navigation? With these questions in mind, I implemented an experimental project which redesigned the navigation system of a web application from content-based to task-based. Then I ran usability testing on each type of navigation system and compared the test results in order to give answers to the above questions.

In this thesis, I introduce website navigation and the theory of information architecture, then describe in detail the thought behind the redesign. At the end, I present the usability testing process and results in order to find out the advantages and disadvantages of task-based navigation comparing to content-based navigation.

2   Background and research in relevant areas

This chapter presents the background of the research in the thesis, including the website navigation mechanism, the information architecture, the principal of redesigning a website and the brief introduction of the website usability testing.

2.1   Website navigation mechanism

A well-designed navigation can be barely noticed by the user yet rarely be appreciated (Kalbach, 2007). In this chapter, I present the most commonly used navigation mechanisms because they are actually the real heroes of good user experience.

   A website navigation as a part of the website user interface, is a collection of multiple web elements, most of which are links to pages. The goal of website navigation is to help users allocate the information, perform actions or browse through the site. The variety of navigation elements is large. The Amazon.com website (Figure 2.1.1) is a good example because most of the common navigation elements can be found from the page, including: 1) navigation bar, 2) breadcrumb tail, 3) tree navigation, 4) drop-down menu, 5) paging navigation, 6) site map, and 7) directory.
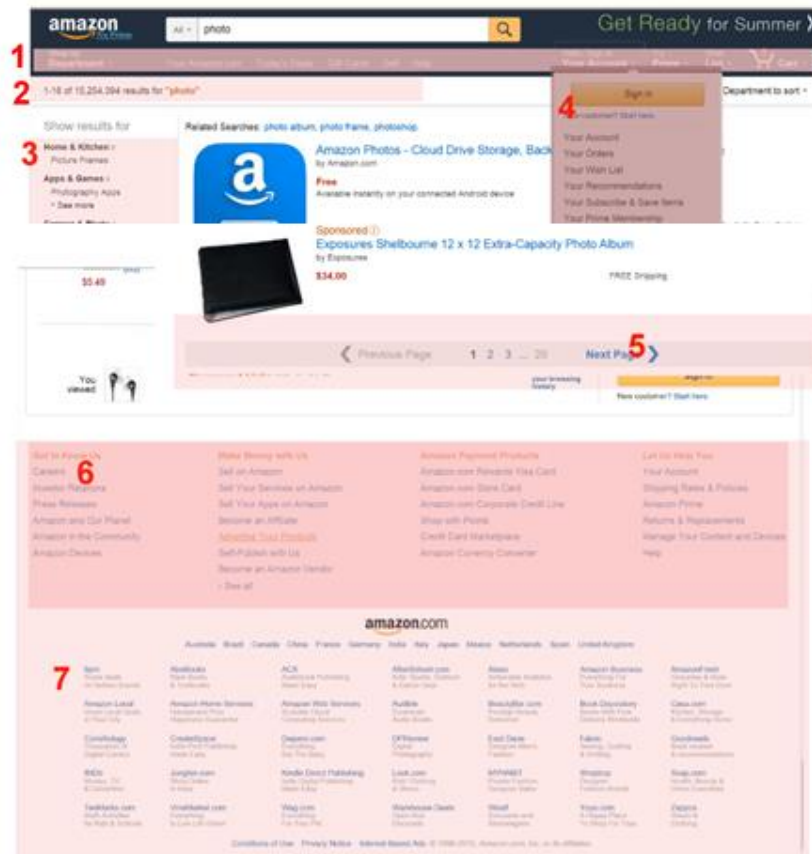

Figure 2.1.1 Amazon.com home page (Part. Accessed on 30 April 2015)

In the following sections, I will introduce in detail the navigation mechanisms, including step and paging navigation; breadcrumb trails; tree navigation, site maps, directions, tag clouds, and A-Z indexes; navigation bars, tabs, and vertical menus; dynamic menus and drop-downs, and visualization mechanisms. The following definitions are collected from the work by Kalbach (Kalbach, 2007), Jakob (Jakob, 2009) and Davis (Davis, 2013).

Step and paging navigation. This navigation puts sequence number to the web pages to simulate books in real life. The difference between step and paging navigation is the text label, the step shows for example "Next >>", "Previous <<". The arrow pointing to left or right gives the user the feeling that switching to the next page is like turning a page of a book. This kind of navigation is widely used in wizard or list contents, for example, registration forms and search results. Google's search result page uses the paging as shown in Figure 2.1.2

Figure: 2.1.2: Paging navigation from Google's search page

Breadcrumb trails. The name is from a fairy tale, in which the heroes left breadcrumbs as a trail to successfully escape from a terrible maze where monsters lived. As a navigation mechanism, the breadcrumb is the trail of the path the user navigated through the site. The link should be either the previous visited page from which the user came or the parent page in the site hierarchy. Figure 2.1.3 shows a typical hierarchy of a breadcrumb.
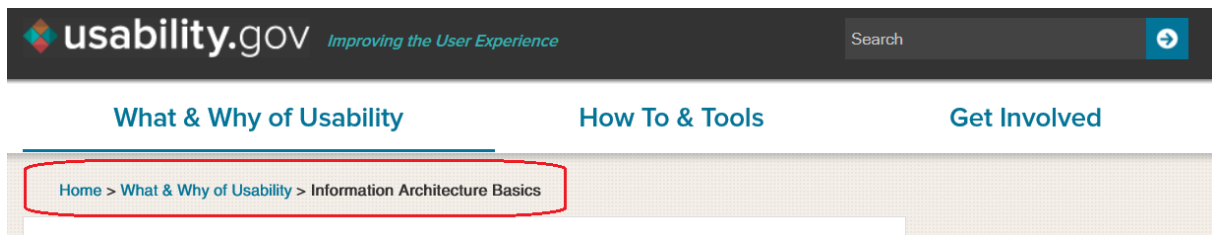

Figure 2.1.3 Breadcrumb navigation from Usability.gov (http://www.usability.gov/what-and-why/information-architecture.html)

Tree navigation. Tree navigation allows users to have a general view on the hierarchical structure. The most common example of a tree is Microsoft File Explorer, where users can see the folder structure. Usually there is a sign in front of each expandable node, indicating the expanding and collapsing state. Tree navigation is commonly used in very long website documents. With the help of JavaScript library such as JQuery, the tree navigation component can provide assistance for users to navigate through the document. Figure 2.1.4 shows the Bootstrap's documentation, which is implemented as a JavaScript plug-in called Affix (*http://getbootstrap.com/javascript/#affix-options*).
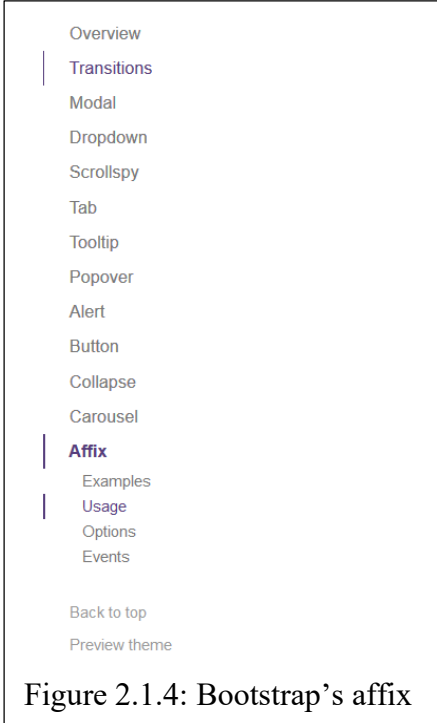
Figure 2.1.4: Bootstrap's affix

Site maps, directions, tag clouds and A-Z indexes. These mechanisms provide either structural or relational information of the website. In many big and complex websites, one or more of these mechanisms are selected to list the most important or most used contents. The footer of Microsoft (http://www.microsoft.com) lists its key products and the most used links in the site map, as showing in Figure 2.1.5.

Figure 2.1.5: Microsoft home page's footer with a site map.

Navigation bars, tabs, and vertical menus. The navigation bar is the most commonly used navigation mechanism. It is usually represented as a chain of horizontal links at the top of a web page. Sometimes the chain is arranged vertically. A tab basically performs the same as the

navigation bar, though it appears to be looked as tab. Feature 2.1.6 shows the navigation bar in Microsoft's home page.
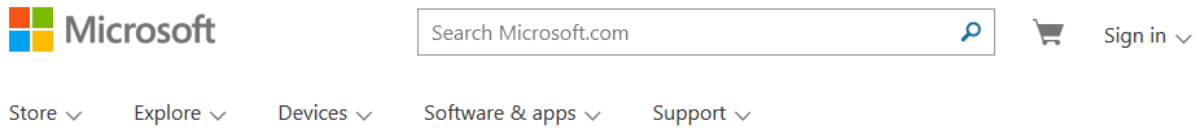

Figure 2.1.6: Microsoft's top navigation bar. (www.microsoft.com/en-us)

Dynamic menus and drop-downs. Unlike the navigation bar, dynamic menus are hidden in the initial state, then they pop up to be visible when users act on the menu area. For example, when hovering or clicking on the parent menu item, the children menu items pop up. The one-dimensional drop-down menu can be extended to a mega-menu, which is "*groups navigation options to eliminate scrolling and use typography, icons, and tooltips to explain users' choices*" (Jakob, 2009). Figure 2.1.7 shows the Microsoft home, which page uses a mega-menu to show multiple products and deeper level navigation items with images.
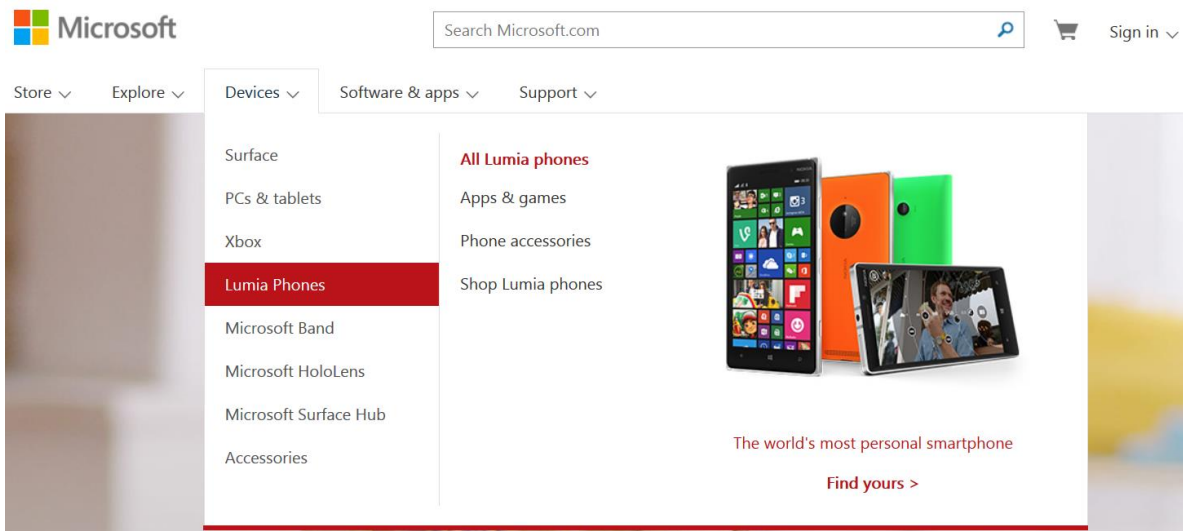

Figure 2.1.7 Mega-menu from Microsoft's home page. (http://www.microsoft.com/en-us/default.aspx)

Browser mechanisms. Web browsers have their own navigation mechanisms. The back and forward, refresh, and home button are commonly visible at the browser's tool bar. Browsing history can be checked from the history button. The URL itself is one navigation mechanism that users can understand the identity of the website and the website structure. Furthermore, users can navigate by manipulating the URL text from the browser's address bar. For example, Figure 2.1.8 shows the navigation buttons in the Chrome browser's top left corner, the URL in the browser's address is pointing to BBC website's health channel.

Figure 2.1.8 Chrome's Back, Forward, Refresh and Home button at the toolbar. The address bar showing the URL of the current website: www.bbc.com/news/health/

2.2   Information architecture (IA)

Information architecture(IA) is about the structure of information and how it is presented to the potential viewer of the web page (Morville & Rosenfeld, 2007). If a website mimics a building, then the information is its brick. The meaning of an architecture to a building is the same as the information architecture to a website.

Morville and Rosenfeld (Morville & Rosenfeld, 2007) defines the information architecture as

1. *The structural design of shared information environments*
2. *The combination of organization, labeling, search and navigation system within web sites and intranets.*
3. *The art and science of shaping information products and experiences to support usability and find-ability.*
4. *An emerging discipline and community of practice focused on bringing principles of design and architecture to digital landscape.*

One more definition from Wikipedia: (Wikipedia, 2015)

5. *Extracting required parameters/data of Engineering Designs in the process of creating a knowledge-base linking different systems and standards.*

A person who builds the information architecture is called information architect. An information architect *as in the creating of systemic, structural, and orderly principles to make something work — the thoughtful making of either artifact, or idea, or policy that informs because it is clear.* (Wurman, 1997, p. 17) In other words, an information architect should be able to interpret and organize huge amount of information, design labeling and navigation system so that customers can find the information they want. A good information architecture is the base of a website providing good usability and findability.

7

Nathaniel (Davis, 2013) describes the conclusion from Morville and Rosenfeld (Morville & Rosenfeld, 2007) that the information architecture combines technologies of library science and building architecture.

2.2.1 Introduction to information architecture

Morville and Rosenfeld (Morville & Rosenfeld, 2007) illustrated the information architecture building process as 3 stages: collecting concepts, building systems and finishing with delivery. The behaviors involved in the collecting concepts include communicating with the customers, understanding the user's need, collecting knowledge to build relationships and presenting the concepts into flexible systems. The second stage consists problem-solving on how to build the system to support fluid navigation, what labeling should be used to describe the content, and how the search is done. Finally, the main IA work finishes with creating a visible plan to help picturing the user interface so that the graphic design work can based on the output of information architecture. Figures 2.2.1-2.2.3 describe the three stages of IA building process.
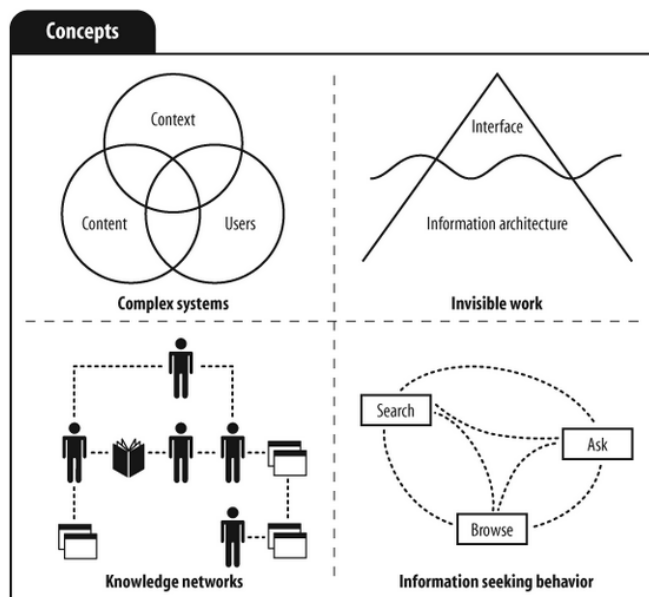
Figure 2.2.1 Stage 1, collecting concepts from different sources. (Morville & Rosenfeld, 2007)
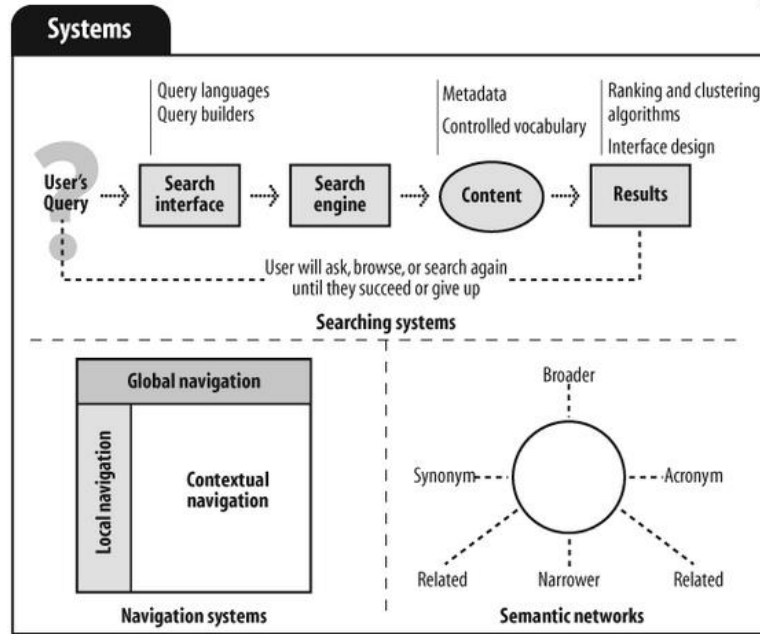
Figure 2.2.2 Stage 2, building IA (Morville & Rosenfeld, 2007)
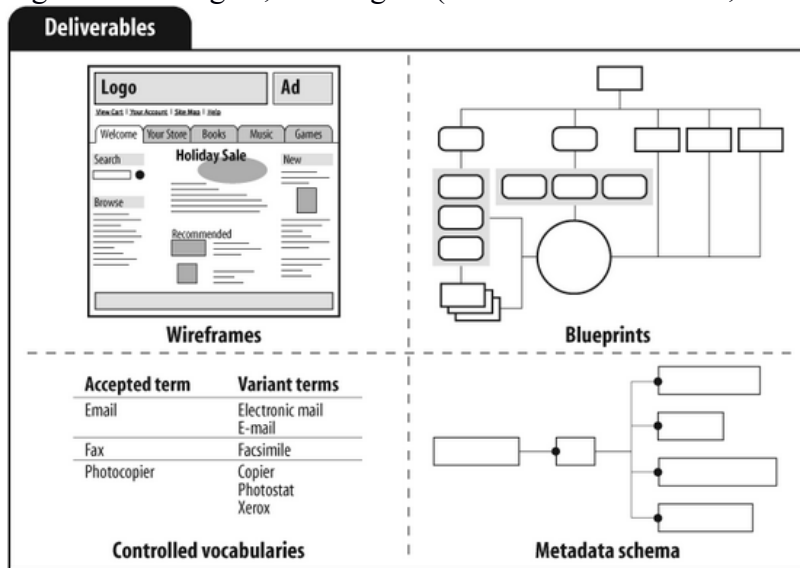
Figure 2.2.3 Stage 3, creating the deliverable product. (Morville & Rosenfeld, 2007)

Most of the information architecture building process is under the surface of the user interface till the last stage, which shows the interface in an early form by creating wireframes. As presented in the IA iceberg (Figure 2.2.4) (Morville & Rosenfeld, 2007), what the end user sees is a peek of an information iceberg.

Figure 2.2.4: Information iceberg (Morville & Rosenfeld, 2007)

The activities carried out in defining IA involve:

- Content inventory
- Content audit
- Information grouping
- Taxonomy development
- Descriptive information creation

The information architecture consists of several components (Morville & Rosenfeld, 2007):

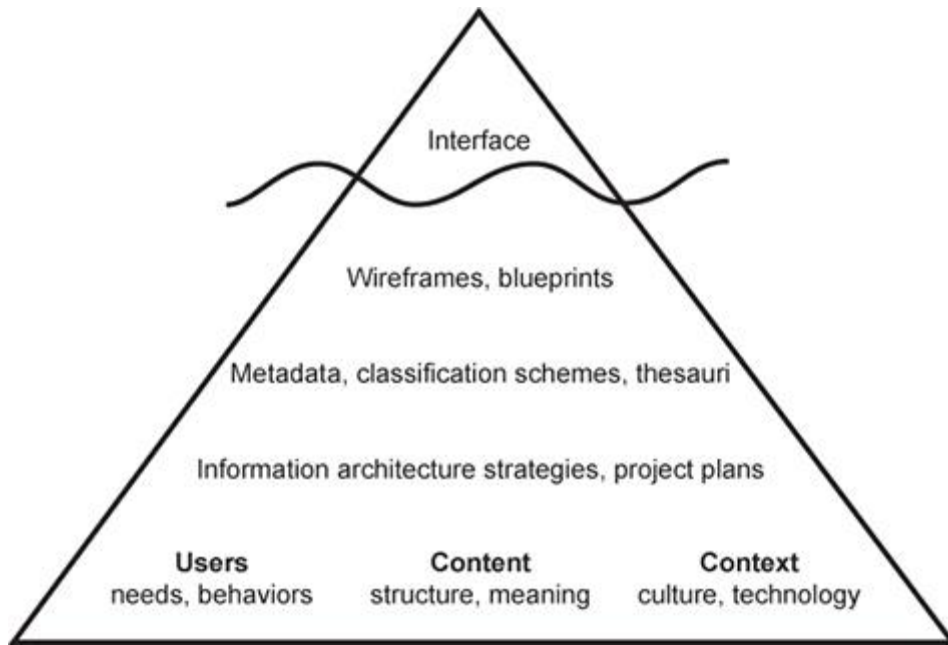1. Organization system. It is not only how the contents are organized, but also how the organization of the contents is seen from the user's point of view. For example, it can be categories or tasks.

2. Navigation system. It is about what concepts or guidelines the user uses to walk through the website, for example, via categories or processes.

3. Search system. Provide the user a possibility to search for the content.

4. Labeling system. It is about how the contents must be described to be meaningful to the user.

Even though IA has a great impact on user experience, it is quite common that it has no direct impact on why users feel lost or cannot find the information in the website. Instead, the navigation system of a website plays more important role in building user experience. The website navigation belongs to the top of the IA iceberg (Figure 2.2.4) and it is the visualized information architecture. More discussion about creating website navigation base on IA is in chapter 2.3.

2.2.2 Creating a website Information architecture

Nielsen (Nielsen, 2009) said that the worst mistake one can make when creating a website is that there is no information architecture. Information architecture is the skeleton of a website. Nathaniel extended the creation process from Morville (Morville & Rosenfeld, 2007) into 6 steps (Nathaniel, 2012) .

First, collect the information on:

1. The business strategy
2. The user requirement
3. The content

Then, analyze the information collected:

4. Organize the content
5. Figure out the information relationships

In the end, visualize the information:

6. Provide the navigation system.

In the following sub-chapters, I will explain why there are these steps, and what should be done in each of the steps.

Step 1: Serve the business strategy

An information architecture is a treasure map of a business content. The purpose of creating an information architecture is to help the website owner to operate their businesses, manage their jobs and present the key business strategies to customers.

Step 2: Understand the user requirement

After defining the business strategy, the second step is to gain the understanding of the user, that is to whom the website provides services.

The understanding of the user includes the following aspects: the context of using: for example, how users expect to navigate through a user interface; the behavior of retrieving information: for example, users use the search or navigate through the layers of pages: the user's level of web using ability: for example, users are not familiar with net technology but want to pay a bill on the net bank, student users who search research publications online, or mobile users and desktop users who would access the same website.

The best way to understand how the user uses the website is to run a user study by observing the user when s/he is using the website. However, in most of the situations, due to the constraints of time or cost, it is not possible to access the user directly. Luckily there are many options for alternative solutions. For example, get experts who works as the end user support and has the

knowledge of the end user requirement. Overall, any forms of user research would give a designer a vision on how to group the content, how much information to show to the user in order to give him or her the ability to process the information provided by the website.

Step 3: Access the content

The access is not only about the links and actions in the website, but also about a common understanding and knowledge sharing between the website and users. The website must communicate in a way users understand. When building the IA, it is important to understand the website owner's intentions and speak the same languages as the website owner and users speak. For example, one of the requirements for building access to contents is that the language, terms, and the labeling system must be agreed with all stakeholders and users.

Step 4: Organize the content

Up to this step, all information about the website stakeholders, users and the website contents are placed on the table. It is time to develop the content model from the user's perspective, particularly how the user views the domain of information from different levels. The content model, therefore is a collection of related content type and their inherent attributes. The content model is then built to a content map, which strongly correlated with the user mental model

Step 5: Figure out the information relationships

Once the content models are created, it is time to link them together so that users are able to navigate from one to another with a logical mental path. The contents can be related via the metadata, which describes the attributes of the content. Metadata can also be used in a search engine or a news-feed system to track and help users to explore more content.

Step 6: Provide the navigation system

In the end, the output of these steps could be a high-level blueprint (Morville & Rosenfeld, 2007) or conceptual mockups. The high-level blueprint is a map of website contents and their relationships. It usually starts from the main page, which contains the contents and actions. It is used as a simulation shown to the business owners and potential users to discuss the requirements and user's work paths.

The information architecture can be documented in forms of diagram, spreadsheet or XML file. Morville introduced tools and methods to prototype information architecture with architectural mockups (Morville & Rosenfeld, 2007). These mockups are used to communicate with graphic designers who produce beautiful web page prototypes.

The conceptual page mockup is another format of the blueprint. Comparing to the blueprints, the mockup helps to vision the pages. This will help the graphic designers to understand what are required in the page. The mockups are quick and dirty, in which no layout or any graphic element are required. Once the blueprint is ready, the next stage to be worked on is the navigation.

2.2.3   From IA to navigation

The information architecture is invisible to the end user, in another word, most of the work of information architecture is hidden beneath the surface of the user interface. On a webpage, one may see texts, colors, graphics and several web elements, for example, links, buttons, list of elements. More interaction methods are used in the website, for example, the mouse hover event may pop up a menu, messages may appear when clicked on a link. None of them can be recognized as information architecture though these visual elements are built upon it. The closest IA element the user can see is most likely the web navigation.

After the steps described in chapter 2.2.2 are completed, the conceptual design of the information should have been finished. Now designers should start planning in cooperation with the internal development team. The planning process involves a chain of iterative activities cooperated with project managers, graphic designers, developers and all necessary members of the team. The plan is to construct the detailed design of pages, for example, the website's navigation and labeling system and making a decision of whether or not the navigation is task-driven, content-driven or data-driven.

The website navigation is built on the base of the information architecture, but they are not the same. The website navigation can be considered as the physical part of the website's information architecture. The navigation pattern is made on base of the complexity of the website's content, for example, how deep the information structure is.

2.3   Deeper knowledge of website navigation

In this chapter, I discuss the website navigation in detail, and its impacts to user experience. User-center design is familiar to almost all stakeholders nowadays. Information should be shaped depending on how the user is going to use it. The website navigation system serves the user to accomplish the goal of their visit to the website.

2.3.1   Design principle

Even though designers can dedicate full imagination in designing the website user interface as well as the navigation style, there are certain rules that must be considered in order to deliver the best user experience. Navigation system should encourage users to browse the website, increase and maintain their confidence. The navigation design is based on IA design, thus they share some common elements: for example, the labeling and the organization of contents.

There are discussions about transforming IA to the navigation system, for example: the amount of categories, the older of the categories and how to design popup menus for touch screen devices (Whitenton, 2015). Nevertheless, the design principle of website navigation should follow common sense and the website usability guidelines, as introduced in previous chapters.

2.3.2   Content-based or task-based navigation

This thesis focuses on the redesign of a website from content-based navigation to task-based, therefore, I would like to discuss further these two types of navigation. Neither term is related to visual appearance, but to the mental path and working process the designer creates and wants users to follow. These two types of navigation are targeting for different users who visit this website with different purposes. Here I am demonstrating the Question.com as an example because the navigation system of this website contains both of these navigation types, which can be a very good example to compare the differences. Figure 2.3.1 shows the website's main navigation panel. The focus of the example is on the primary navigation panel, which is marked by frames. The navigation is clearly divided into two parts. The left part is presented as content-based navigation because it contains "Home" and list of subjects. The right part presents a typical task-based navigation: it contains two phrases: "Ask a question" and "Answers Questions".
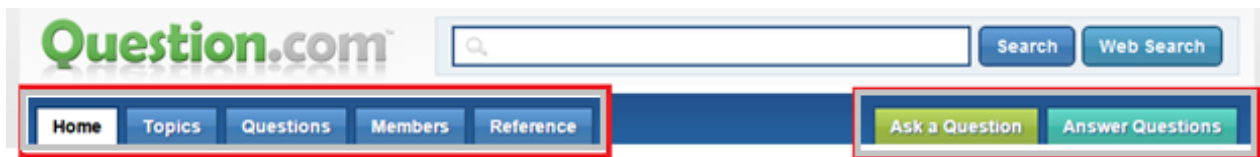

Figure 2.3.1 Navigation bar contains both content-based and task-based types of navigation.
From www.question.com accessed on 12, April, 2015

2.3.2.1   Content-based navigation

Content-based navigation, sometimes also named as topic-based or object-based navigation, is a website navigation method that is organized based on the content of information or object (CHI, 2004). This method allows users to select one object then do tasks related to it. This method works well in websites where the main target for users is to find out information. This is the most commonly used type of navigation structure in the website based on organizational structure.

In the Question.com, the website follows the use case when users come to visit without a specific target or may just want to browse around. If the user clicks on the "topic" tab, then a view where information is organized by index is showing (2.3.2).

Figure 2.3.2. The index of topics from Question.com (https://www.question.com/topic/)

Another typical use case for content-based navigation is the intranet website, on which the content mimics the organization's department structure. The advantage in applying this type of navigation is each department holds and maintains its own component, which makes possible users have a clear overview of the whole organization structure and be able to navigate into specific sections. By doing so, the cost of maintenance can be controlled because each department is responsible to its own content and it is certainly easier to maintain.

2.3.2.2 Task-based navigation

Task-based navigation is based on the list of tasks users can perform. This method works well in web-based applications by which users use to complete their tasks (CHI, 2004).

In the Question.com, task-based navigation (the right part on Figure 2.3.1) consists of a list of actions, which start with verbs: "Ask" and "Answer". The Figure 2.3.3 shows the page after clicking "Ask a Question" item. There is an empty form with two text inputs for the title and the content, some control buttons and a "Continue" button at the bottom of the page. This page looks very different with the one shown in Figure 2.3.2. There is very little information presented in the page, instead, the "Continue" button guides the user to the next step. The page does not have many interactive items and leaves the user only one action. This design clearly serves for one goal: let the user submit the form.
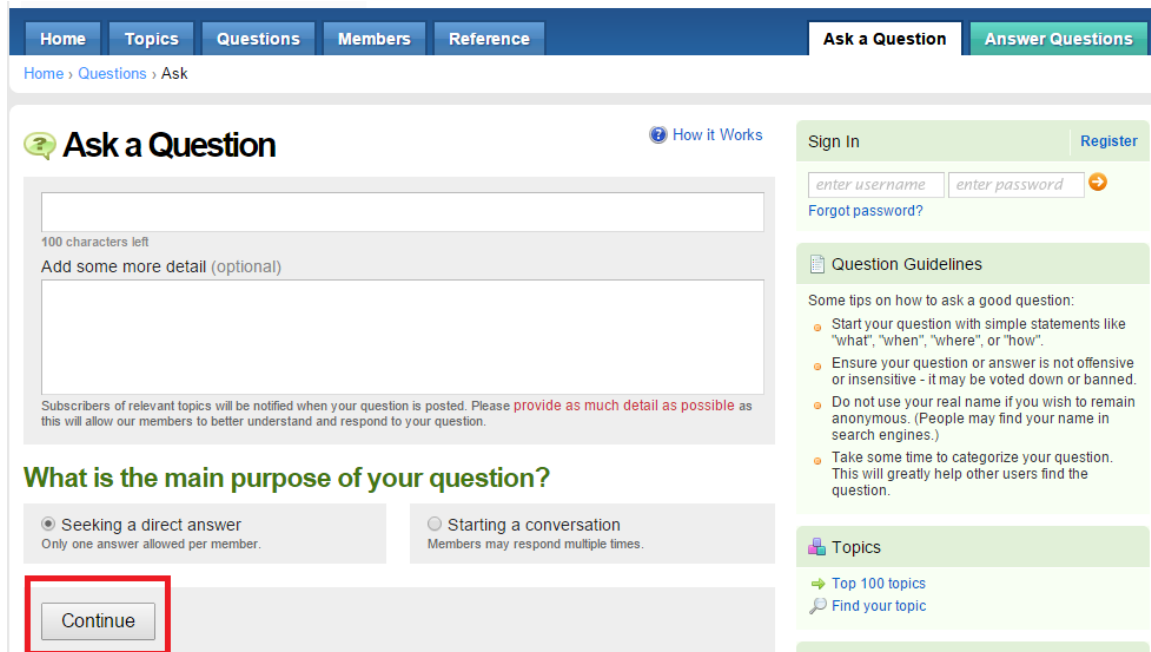
Figure 2.3.3: The page after clicking "Ask a Question" (https://www.question.com/ask/)

Nielson Norman Group (GROUP, 2014) did an analysis showing that comparing to content-based navigation, task-based navigation is more adaptive to the frequently changed and expanding website. For example, in case of intranet change after reorganization of a company. As a matter of fact, more and more intranet websites utilize the task-based navigation as their primary navigation method.

Designing the task-based navigation is not easy, because it must be truly user-centered. Ideally, designers spend a long time on studying users by observing how they complete tasks and interviewing, then design the navigation based on the study results. However, in the reality those who create new designs, would have to make a guess based on existing data and experiences.

In my opinion, whether or not to prefer task-based navigation over content-based navigation depends on the ultimate propose of the user who visits the website, and the major function of the website. It is anyway important to understand the user's task flow when designing task-based navigation.

2.3.2.3 Discussion

Which one is better: task-based navigation or content-based navigation? Discussions on it have been all around for many years (CHI, 2004) (White, 2014), but no one can give a definite answer. Each of the methods may show advantages in certain circumstances, therefore designers need to choose the best approach according to the real situation and conditions.

Content-based navigation has the following features:

- Presents the hierarchy of a website and gives users an overview about the relationships between contents of the website. On the other hand, the width and depth of information structure may be an issue, especially when it is not a hierarchy structure.
- Good to be used when there're no many tasks to do. For example, when the website is only used for searching or managing something, there is no point to use navigation as "Search <something>" or "Manage <something>".
- When the users have to work in a parallel workflow and frequently jump between contents, the content-based navigation can be very convenient to guide users. On the contrary, task-based navigation usually works in a linear workflow, it is hard to jump from one to another without extra actions such as save or pause.

Task-based navigation has the following features.

- Easier for novice users, because it provides a clear path for the user to complete a task. On the other hand, it is hard to predict the user's behaviors and wishes. It is quite a challenge for designers to design the tasks.
- Faster in a way the user can start working on something immediately. This is clearly a goal driven process. It works well when users do know clearly what to do, for example, know how to fill an empty form. However, when users are familiar to the system and want to improve the efficiency, the website has to provide a short-cut to allow users complete the tasks faster.
- Good to use when the workflow is linear processing. This design approach can filter out the contents irrelevant to current task. However, it leaves limited possibilities for users to switch between contents during the task.
- Users cannot easily build a map of the website in mind because they cannot perceive the structure of the website from the navigation.

There is definitely no harm to combine these two types of navigation: indeed, many websites have done so. Question.com is one of the typical examples, in which the navigation items are clearly divided into two parts. It does not matter if the website visitor has a clear purpose or just wants to browse the website, as long as he or she can find the way to do it. Nevertheless, in many situations it is difficult to divide all categories into tasks or contents, combining them seems to be the only option.

2.4   Intranet specific

The intranet website has specific features, for example, the amount of information is tremendous, the resource of inspiration is limited due to company restrictions, and the structure of the website cannot be too unconstrained. In the intranet design, the term is no longer an issue, it may implicate something known only internally.

Even though organizing the intranet navigation by departments seems to be a quite straightforward idea, it turns out to be one of the most common mistakes designers make when constructing the navigation. Because along with the growing of business, the company may have to go through many organizational changes in time. Every time when the company departments change, the intranet navigation will have to change accordingly.

It is quite common that the intranet website follows style and design patterns defined by its company: the navigation bars, menus, page footer and the most common controls in order to keep consistency in pages created by different teams. Therefore, design the website navigation need to take the company website style into consideration. Shortly, when designing an intranet, the biggest achievement designers would receive is that the employees can find their information quickly and perform their tasks efficiently.

2.5 Website usability testing

Usability testing is the most useful and commonly used method to verify the level of usability of a product. In this section, I will introduce the website usability testing.

2.5.1 Website usability

The concept of usability is not new to the most of the website designers: Usability is all about how easy it is to use a human-made object (Thomas, 2012). More specifically, website usability is about learnability, efficiency, satisfaction and errors when a user interact with the website user interface (Usability.gov, n.d.) (Usability, 2015). Learnability can be represented by how easy the user can start using the website or whether or not the user can learn to use the website by observing the website interface. Efficiency is how quickly users can complete their tasks after they become familiar with the website. Satisfaction is about how pleasant usage of a website can be, for example, how users enjoy the user interface. Errors refer to a number of errors users make while accomplishing a task, the severity of the errors and how easily they recover from these errors.

Usability is important from all aspects regardless the type or purpose of a website. Customers will leave a website if they cannot find the information quickly enough, especially if it happens due to the website's poor usability. For an intranet, usability affects employee's productivity. The intranet should help employees to get their work done as efficiently as possible without wasting time looking for information or wondering what's happening around.

2.5.2 Usability testing method

Usability testing is a technique used to test and evaluate the usability of a product (Usability testing, 2015), in this case, a website. There are many usability testing methods (Thomas, 2012) (Usability

testing, 2015). One or more testing methods can be used in one usability testing section according to the situation. Below, I describe the common website usability testing methods.

Hallway testing. This is a general usability testing method. Its distinguishing feature is testers selected randomly (from hallway) and they provide outsider's opinion to the product. The testing section should be kept short. The importance of this testing method is to gather user's first reaction to the website interface.

Remote Usability Testing. In this scenario, the developing team and testers are located separated in a far distant. Usability testing is more cost efficient when implemented remotely. The synchronous testing methodologies involve video conferencing or remote sharing tools that enable participants communicate in real time. The asynchronous testing methodologies usually include automatic data collection methods by logging user's activities, tracking clicks and browsing history, so that testers can be in a rather comfort and natural conditions to simulate real-life scenario.

Expert Review. Experts with experience in the usability field come to evaluate the website. The most typical and well-known method is the heuristic evaluation defined by Nielsen (Nielsen, 1995), who described the 10 usability heuristics to measure the usability. This method may not be very detailed, but it is the one of the most efficient and commonly used methods to evaluate a website.

Pre- and post- questionnaires and Interviews. This is perhaps the best possible testing method, but a very expensive one as well. Observer and user are one-to-one, the observer has a chance to ask the user direct questions. The pre- and post- questions are asked in order to compare the answers from before and after users used the website. Questionnaires can be answered off-line, however, interviews require observer and tester to be face-to-face. The questions asked in the interview section can be more open and the observer can make new question according to the tester's responses.

A/B testing. Two versions (A and B) of design are compared to identify which version better serves to the expectation about the website. In case of designing a new version of a website, the method can help make design decisions by comparing the results from both sections.

2.5.3   Planning a usability test

Usability tests need to be carefully planned to get the optimized results. It concerns about the selected testing method, how to collect the result, who to be invited to participate the test, how to arrange the test location and time and etc.

When considering the usability testing tasks, the following usability testing aspects can be taken as the guideline:

Visibility: Do users see key navigation element on the page?

Labels: Are labels clear and understandable?

Orientation: do users get lost when moving back and forth?

Findability: are users successful in locating the information they need?

Efficiency: can users complete seeking tasks quickly and efficiently

The list of metrics to be collected (Foraker Labs, 2015):

- Task Completion rate
- Time required to complete a task
- Frequency of "Help" used
- Error rate
- Subjective satisfaction measurements

Nielsen suggested that 5 testers would be enough for a usability testing (Nielsen, 2000), because 85% of usability problems can be already discovered. Figure 2.5.1 describes the result on this aspect from Nielsen's research.
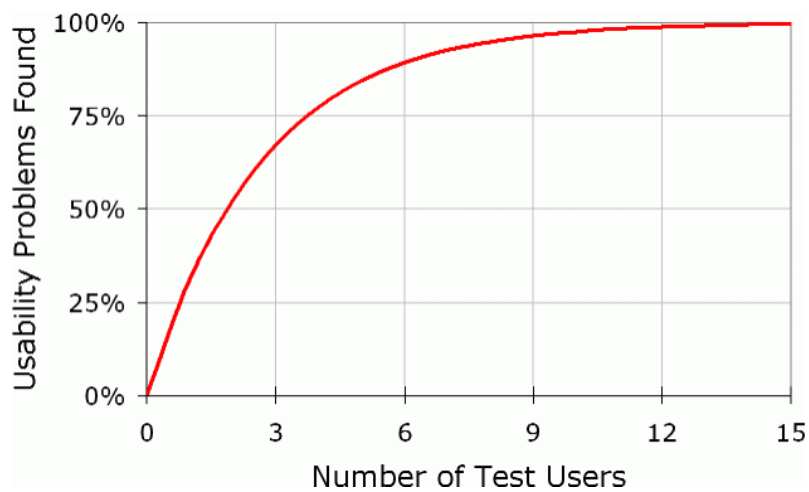

Figure 2.5.1. The relationship between the amount of users and usability problems found. From Nielsen's research. (Nielsen, 2000)

Five more testers can probably find the rest 15% of the problems, however, it is much too expensive comparing the amount of effort and the outcome. He suggested that with the same budget, comparing with hiring 10 persons at a time to do one usability testing, it is more cost efficient to first start working on the project from the output five testers, then test again with another 5 testers on the project which has been working on.

3 Redesigning the Nuage website navigation

In this chapter, I describe the reason and process of redesigning a website, then introduce the website which was redesigned in the thesis: Nuage, and at the end explain how the Nuage website was redesigned.

3.1 Redesigning a website

Websites need to be redesigned every now and then. There could be many reasons website owners decide to redesign their website: for example, adopt a new technology, change website style, update information. The new design must make sure it has the same functions as the existing one and users can complete at least the existing tasks as using the old website. The above mentioned is only part of a website redesign requirement though it is not necessary to involve any visual effect redesign. In order to accomplish the redesign of a website, it is important to understand what website redesign is and how to do it correctly. In the following chapter I will briefly introduce theory and process of the website redesign.

3.1.1 Definition of a website redesign

The very first thing to be done before start working on a website redesign is answering the question, why does a website need to be redesigned? People and companies may have different reasons for redesigning, the answer may be as simple as one sentence:

It's not just what it looks like and feels like. Design is how it works.

–Steve Jobs (Walker, 2003)

Playfully speaking, design when it feels right, redesign when it does not. Of course, feeling is a parameter that is hard to measure. To make the decision to redesign a website, one needs concrete reasons. Below are listed those most commonly used (Cheetah), (Ian, 2014), (bMighty2 Company):

1. Better organize and manage the content of a website. It is quite common that after years of development, the company's business has changed. The previous web design no longer serves best the company's business goals. Therefore, removing the old content and arranging the layout for new content is one way to keep the company information up-to-date to its users.

2. The UI layout and technology in use are outdated. As time flies and technology grows, the fashion of website style and the technologies used to build the user interface bring the visual appearance of the website to look and feel dramatically different. If the website was designed four years ago, maybe it is time to catch up and bring a fresh new look to the website users.

3. To enable mobile friendly browsing. It used to be a painful experience for users when browsing a website on small-screen devices, such as mobile phone or tablets. Mobile devices play an increasingly important role on website browsing media. For many companies, especially online retailers, designing a responsive user interface for the smaller screen is crucial for

company business. Also, due to the differences between mouse control and touch screen control, the interaction and layout of web elements must be carefully rearranged.

4. Improve performance and usability. Though this is the last item in the list, I would like address my emphasis on it, because, in my opinion, this would be the best reason to drive a website redesign section, though it is not always such. That is, designers must find a way to improve the quality of the website from the user's feedback and tracked data after a period of using the website. They reorganize the information architecture and the website content according to the feedback in order to provide better services to the end user.

The reasons listed above are those I think more commonly used. There are some less important reasons. For example, website owners may decide to redesign their website in order to incorporate social media or to add new functionalities. Of course, a website owner may use any reasons to change their website as long as it brings business benefits. In this thesis, the redesign is a proactive approach.

There are two type of redesign process: traditional revolutionary site redesign (RSR) and modern evolutionary site redesign (ESR) (seodiesel, 2015). Chris Goward (Goward, 2012) compared these two methods and predicated that the ESR would be the future of website redesign. The RSR is applied usually when the website had received so many issues and it had many requests to improve the features. The RSR will dramatically change the appearance and content of the website. On the contrary, the ESR is a continually integrated process, which makes small improvements all the time, has much less risk, and keep the website up-to-date all the time.

When it concerns the website redesign, the ROI is a very important concept. *Return on investment (ROI) refers to the return value in Profit, savings, or productivity that can be attributed to a given investment* (Foraker Labs, 2015). ROI is about money, and a good usability design helps increase ROI. Usability testing result is the key factor to measure ROI and eventually evaluate whether or not the website redesign is successful. The ROI measurement which shows, for example, the increased task complete speed, the decreased error rate or the increased income, would be a convincing feature to be presented to the upper-level managers.

3.1.2 How to redesign website

Redesigning a website is more challenging than creating a new website, because designers need to consider the old users who are familiar with the original user interface and the functionalities. Keeping consistency between two versions somehow limits the imagination of designers who cannot be too creative to change too much and break the user's task routine or take too much effort to learn. The goal of website redesign is to bring greater benefits to the website owner. For example, to be able to bring more visitors, allow tasks to be completed more efficiently, save money for customer services and training, encourage more sales.

Redesign process is expensive and time consuming. Therefore, it is important for all website owners to have clear goals for redesigning a website before everything starts. The more concrete the goals are, the better result will be. Firstly, the goals can help designers utilize the limited time and resources to concentrate on solving the truly critical problems. Secondly, the usability testing used to evaluate the redesign result can be built on the basis of the goals. Finally yet importantly, goals with clear measurement serve as the guidelines to evaluate the success of the redesign.

It is quite usual when redesigning a website, that designers and website developers as experienced users are so familiar with the website that they may not have noticed the issues for new users. Therefore, when designers need to redesign a website that they are already familiar with, they have to think out of the box and figure out the potential problem the current website has.

3.1.3   Process of redesign

In the previous chapters, I have described the website redesign theory in general. Now it's time to talk in detail about the process of the website redesign. The redesign process guide from Chelsea Baldwin (Baldwin, 2014) can be useful. According to the Nielsen Norman Group the intranet design process recommended in 2007, haven't been changed recently (GROUP, 2014). In the guidelines, the website redesign can be described by the following steps:

1. Set a goal. A website redesign targets designing a replacement of the current website, which may probably still be functional and used by users. The website owner needs to have a clear understanding of what problems the current website has, and then set expectations to solve the problems in order to achieve a better business value.

2. Document functionalities the current website has. One of the key features of redesigning is to delight and keep users who are already familiar with the current website. The documents created during redesign process are not only used to make sure the new design will be compatible with the old one, but also make sure the old users can still find all information they need.

3. Track time and actions. The purpose of the tracking is to maintain the cost of the redesign on a reasonable level. Comparing to the cost spent on maintain the current website, the cost on the redesign is also one important factor to measure the business value. Tracking is one of the most important methods used to observe the work progress and detect early problems.

4. Listening to the user. Understanding the end user is critical to project's success. There are many methods to get the end users analyzed, and I am not going to have any further discussion on it in this thesis. However, I do want to emphasize that a website redesign is based on the fact or assumption that users are not satisfied with the current website. It is very important to understand what bothers them the most in order to prioritize the redesign goals.

5. Keep carrying on the usability evaluation. Usability evaluation can be done in the early stage or the redesign process, even when the design hasn't finished. Take a good use of the mockups and prototypes, and developers as the pilot testing user.

6. Keep content valuable to the user. One of the most mentioned benefits of a website redesign is to make users find information more easily. Therefore, users are expecting the content and information shown in the website is the most updated.

3.2   Introducing Nuage

The website redesigned in the thesis is called Nuage. Nuage is a web-based information management tool developed by Nokia in 2008. At that time, Nokia sold hundreds of models of phones globally. Mobile phone software needs to be configured correspondingly to adapt to local markets, thus one device model has many software variants, each of which contains hundreds of configurable parameters. This set of parameters is called a configuration. The example types of configuration include native applications and operator applications at the home screen, local network settings, local favorite or market applications. Nuage tool is an enabler for managing mobile phone software variants and configurations. Since 2008, the Nuage tool has been used by 3 platforms: Meego, Symbian and Windows Phone. Over 40000 software products have been configured and delivered via the toolchain. Sales teams can create, configure, test and approve their own phone software variants locally using Nuage, which provides flexibility to the teams and saves cost and time.

Mobile phone software configuration is a very complicated process, which involves tens of different departments. The tool contains a tremendous amount of data and inner data dependencies. The variety of conditional variable combinations increases the complicity more.   Figure 3.2.1 describes briefly the end-to-end process to configure a phone software variant.

Users, including technical application managers (TAMs) and technical sales team, create one software configuration according to their specific requirements, which differ by regions, countries, operators. Nuage tool collects information and builds the configurations into a downloadable E-sample. The E-sample then enters an iteration process of software testers, hardware (phone) testing machines and the team who created the variant. This process ensures the quality of the variant from a technical point of view. Then the E-sample is presented to customers, for example, the operators. They install the E-sample on phones to test and verify the installation. They approve the E-samples which they are satisfied with. In the end the variant containing the approved E-sample is finally delivered to factories. The phone manufacturing can then be started.
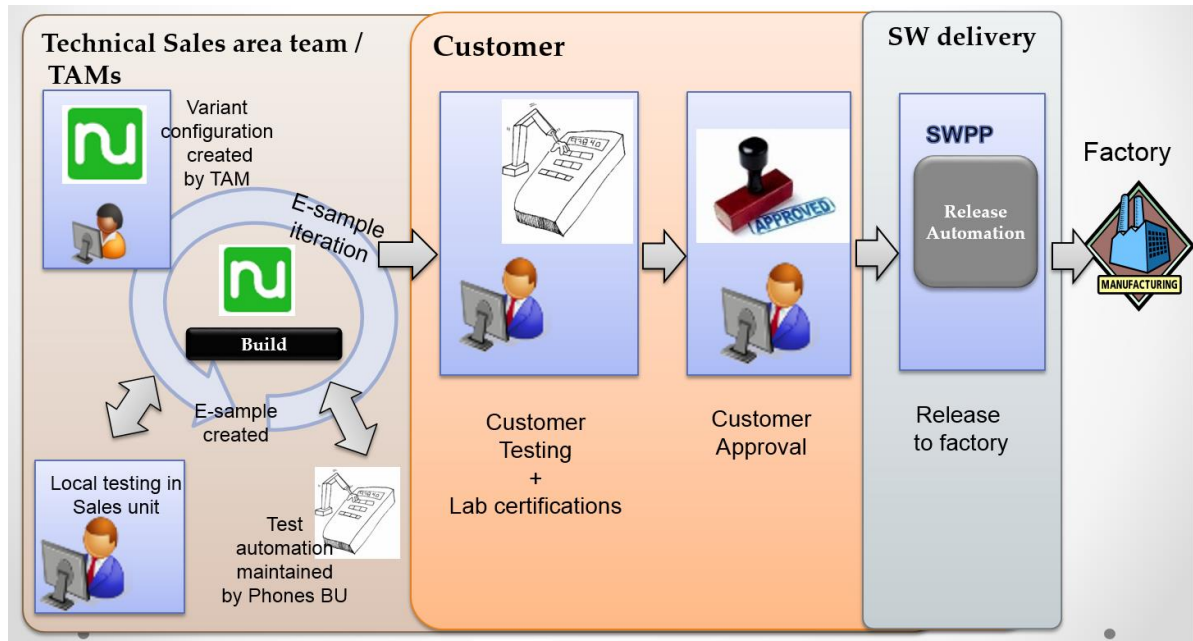
Figure 3.2.1 End-to-end Process flow for configuring and delivering Nokia device software variants.

Users of the Nuage website are limited to Nokia's internal employees, for example, sales, product managers and customer supports. Therefore, the website follows the pattern and style guild of an intranet website.

Nuage as a website is 8 years old. It has been dramatically enlarged since its launch, and it has been enclosed and combined with many other tools and features. This increase in contents made the current content-based navigation system troublesome to use. Before this becomes truly a problem, we would like to investigate into the research to check if there's an alternative way of arranging the content in order to improve the user experience and adapt to the increasingly complex environment.

3.3 Analysis of the Nuage website

This thesis is concentrate on redesigning the website navigation. Moreover, in order to make other website components consistent with the website navigation and improve the overall user experience, I will redesign other website contents as well. In this section, I present the Nuage website and analyze its features in terms of website navigation quality and information architecture point of view.

Nuage is an internal web-based tool used by technicians and employees who received proper training. There have been many issues discovered since its launch. The feedback has been gathered from different groups of users, most of the complaints are about lack of the user centered

functionalities, the complexity of the system, the slowness and the lack of the feedback. I will present the user analysis data in following sections.

3.3.1 Many functional pages

Throughout the whole Nuage website, most of the pages are functional pages. The main purpose of a functional page is to serve users to complete tasks and manage a process. First of all, functional pages often contain little text and there is a lack of inner navigation and hierarchy relationships between links in the page. Secondly, there are usually many contextual links and cross-structural links, which lead users to jump from one task or category to another. If users switch to other pages during the process, they can easily get lost. Thirdly, usually there are many web forms in the functional page with automatically saved fields. In addition, in Nuage, there are many pages that contain forms with different types of input, buttons dedicated to various actions, and tables showing a large amount of data.

3.3.2 Poor information architecture

The Nuage website is short of information architecture. There were many reasons: lack of overall picture of the website, lack of requirement and the vague concepts of relationships between components, but none of them can be the excuse of underestimating the importance of the information architecture. When the complexity of the website was increasing along with an expansion of the website and an increase in functionalities, more layers were added to the website categories and more links to pages. It became more and more difficult to find information and tasks were sometimes buried deep under the site structure.

The deeply layered and highly fragmented website structure was formed due to various reasons: firstly, the requirements were not complete when the website development started. Actually the requirements were building up at the same time the website was developing, and there was no time to plan them and no vision existed of what was next to come. Secondly, there was a very tight schedule for the development process. Thirdly, this tool is technology driven: it was based more on how technologies could be presented other than how well users could use the tool.

So far, the information architecture mistakes (Nielsen, 2009) can be identified from the Nuage include:

1. No information architecture. The Nuage website was built using a technology-driven process. The Nuage navigation was also divided by categories which were categorized by technologies and implementation teams.

2. Missing landing page. Nuage did not have a "home" page, nor any landing pages. The initial page already belonged to one of the categories and contains results of the default search (Figure 3.3.1).
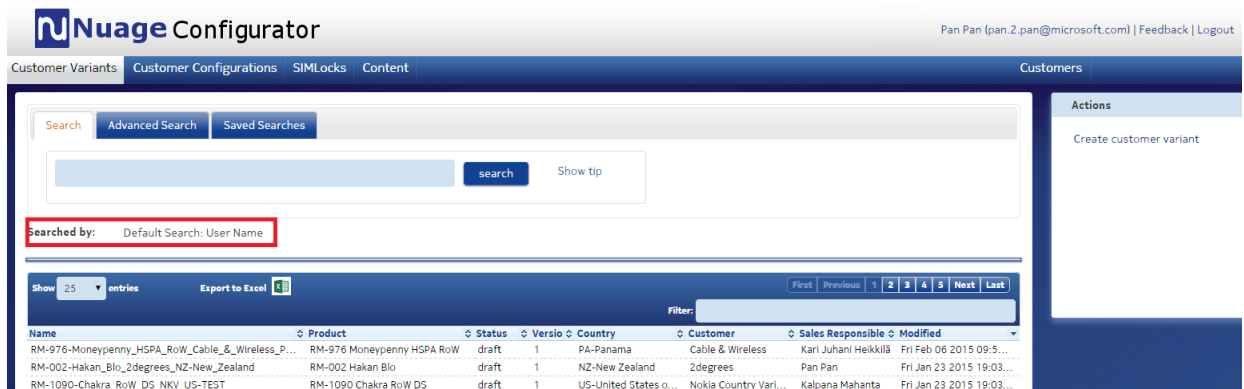
Figure 3.3.1 The Nuage website's home page, which shows the result from the default search.

This page did not meet the criteria for a home page because it contained only information of one category out of the listed five main categories. It could not be a landing page because it did not provide an overview of this category nor an outline of the section as a landing page should do. On the other hand, I have to point out one of the advantages of this concept: users who are familiar with the website can jump straight to the page or location on the page where they can start working on their tasks.

3.3.3 Lack of user-centered design - Users' wishes

The Nuage design and developing teams did not have direct connections to end users, because users of this tool were in other organizations of the company and were distributed in the whole world. The developing teams had little opportunities to really see how end users used the system.

I collected data by requesting brainstorm session from small groups of colleagues who worked close to the end user: two end-user representatives, one process designer and one technical support. The task was the following: assuming you were the end user; what features would you expect the version of Nuage to have? It was not surprising that most of the answers were so called "self-centered".

In total 48 wishes were gathered (Appendix 1). The largest number of wishes belonged to one category: "See my stuff", which meant users wanted to see the tasks they were working on. For example:

- See my created items.
- See my modified items.
- See my bookmarked items.
- See the items that I am interested in

The second large group of wishes was "Be notified", which meant users wanted to be kept updated and be aware of work situation and progress status. For example:

27

- Be notified when my created variant is built.
- Be notified when others modified my variant.
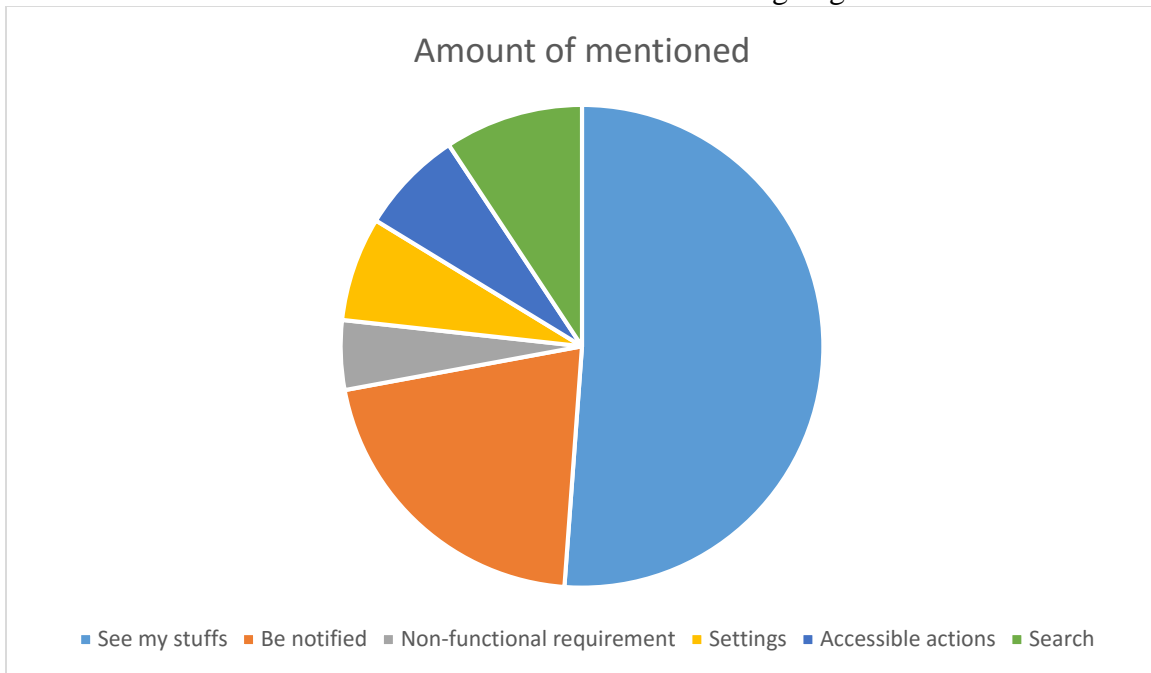- Be notified when service break or maintenance break is going to occur.

Figure 3.3.2: User wishes distribution. The data were collected from the result of brainstorm session.

As shown in Figure 3.3.2, users need the visibility in the contents, actions, and information which are relevant to their own tasks. Furthermore, users want to increase the awareness of their whole process, they want to be able to observe the process, and be informed when the concerned situation changes.

3.4   The goal of redesign

Setting up the goals has always the highest priority of all tasks to be started. In this chapter, I will explain the goals of redesigning the Nuage website according to the user analysis presented in previous section.

3.4.1   Strategic goal

The strategic goal is an improvement of the usability of the Nuage website. It guides the direction and arrange the prioritization of the redesign project. There are three detail goals, consist of:

1. User-centered and task-centered navigation. The navigation must help users to be able to finish their tasks with minimum instructions. User should be able to start working on the tasks, process with required actions, check the state and finish it with intention. Actions that are relevant to the task should be clearly visible and actions that are not relevant should be properly placed to

avoid distraction. As a matter of fact, improving the learnability can be considered as a secondary goal under this scope. In the usability testing, the task success rate is a key measurement, especially for the novice users who received little training about the system.

2. Increase the awareness. The user should be aware of the environment and the state of the tasks they are doing. That is, as one of the usability testing methods, users should always be able to answer the following questions no matter in which page they are: what are you doing? Where are you? What are you doing next? Moreover, the user should be notified when a task status changed.

3. Improve the efficiency. Increasing efficiency is important for this internal tool. It is important to provide quick access to information and allow users to be able to complete tasks as fast as possible. Avoid errors or inform users about the error as early as possible can be considered as one way to improve efficiency.

3.4.2   Practical redesign goal - Design of the new navigation

In order to accomplish the strategic goal, more specific goals need to be set up. These goals affect the design decision and can be directly used as measurements to evaluate usability improvement.

1. Users use less clicks and navigate to fewer pages to complete one task
2. Users can be informed when the environment change.
3. Complete a task without instruction.
4. Users can see the most relevant information to their task.

1. Use less clicks to complete one task. From the usability point of view, it is recommended that the content of a website should be accessed within 3 clicks, and the hierarchy could be rather wider than deeper (Kalbach, 2007). In slow network connection, each page loading may take couple of seconds. Thus, opening many pages to complete a task can be a painful process. Therefore, reducing the amount of clicks can not only simplify the task for the user, but also can save resources for a company.

2. Users can be informed when the environment change. The environment term in this situation means the background process and operation, which is not visible directly from the user interface. These operations usually take rather a long time (from minutes to hours) and do not block UI. Application user interface should not only be able to inform users about the process completion, but also guide them to check the situation.

3. Complete a task without instruction. For normal web applications, ease of learning is a very critical requirement because the public web application users usually are not willing to spend time on learning. If the application seems to be difficult in use, users can easily search for an alternative website. The situation is less severe in the case of intranet web application. Application users will receive training and spend a long time learning to use the system so that they can use is correctly.

29

However, from the company point of view, saving time and costs of training can bring benefits as well. Therefore, the navigation should not only be able to guide users, but also provide functions that are meaningful to the user.

4. Users can see the most relevant information to their tasks. This is not only about improving the information visibility, but also improving the value of information. As mentioned in previous section, users wanted to see the information relevant to their tasks. They do not care so much about information that is not relevant to them. It means the website should help in filtering the information and show only user relevant content. For example, the navigation items can be selectively shown depend the user group of the current user.

3.5   The new design

In this chapter, I describe in detail the Nuage website redesign and the reasons and ideas behind each design decisions. I will first describe the information architecture I had built up for the Nuage website, then elaborate the redesign details. I am going to concentrate on redesigning the navigation system and changes the page layout accordingly.

3.5.1   Building up Nuage Information architecture

As I have shown in previous sections, the biggest problem of the Nuage website is absent of the information architecture (IA). In the following sections, I will present the information architecture I built up for the Nuage website in the redesign project. The purpose of IA is to get an overall picture of the structure of the Nuage website and inner relationships between components so that I can do further redesign on the user interface on top of the architecture.

The information architecture graph is presented in Figure 3.5.1. I separated the content into two groups: one major group and one asynchronous operation group. The major group contains the most important content of the website, including variants and configurations and the whole managing process. I will explain this content in more detail in the following section. The other group consists of processes that are operated asynchronously, including the SIMLock (a setting for configuring phone's SIM card) and content (a setting for arranging content configuration of phone) management. These processes are not critical to the end user when accomplishing the basic tasks, and they usually take a long time. For example, the SIMLock is one setting out of tens in a variant, it is used to set restrictions to the variant when required by an operator. When a SIMLock is needed, users will send a request via Nuage. The request then will reach operators. Operators will decline or approve the SIMLock and send it back to Nuage. Then users will either request again or use it in variant setting. The SIMLock request may take hours or days from Nuage operators. During this period, users can still use the Nuage website to do other tasks.

3.5.2 Redesign Workflow

The major content of the information architecture describes the lifetime of configuration and variant. Here I explain in more detail:
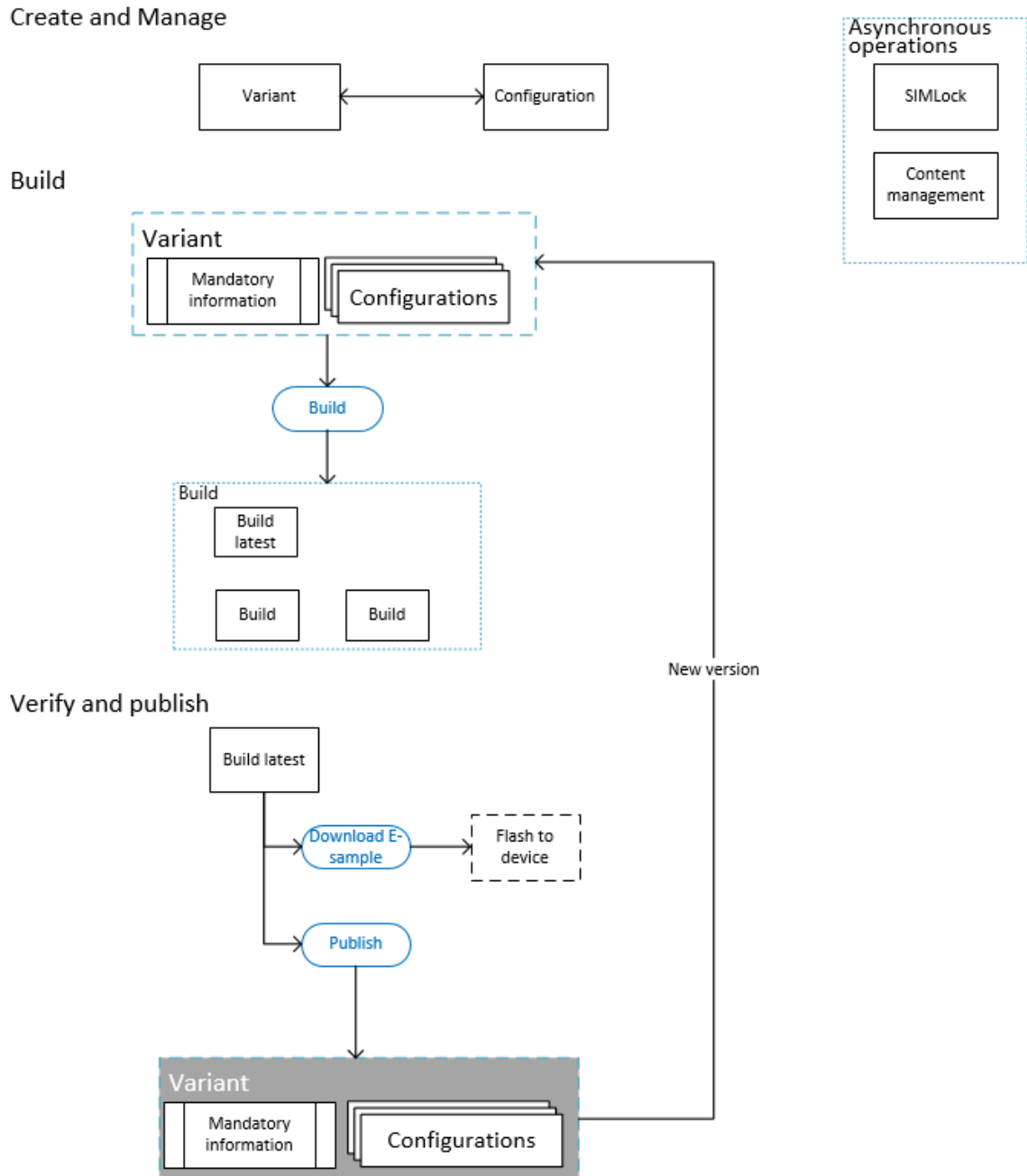

Figure 3.5.1 Information Architecture of the Nuage website

Stage 1: Creating and Managing

Variant and configuration are created and managed independently in this stage. A variant can include multiple configurations and a configuration can be included in multiple variants. There is no strict relationship between these two components. All variants and configurations have their own unique ID. In this stage, variant and configuration can be invalid, which means some mandatory information is missing, settings are invalid or data is out-of-date. A variant cannot be built unless all mandatory fields are filled and valid. The variant building is another story, and will be discussed in stage 2.

Even though configurations can be created separately, but only a variant can be built into an E-sample. The E-sample can be downloaded, flashed into a device and delivered to clients. In other words, the variant that contains a valid E-sample is the final product delivered by Nuage. Therefore, the variant creation is considered as the primary task, and the configuration creation as the secondary task. The variant creation process is described in Figure 3.5.2.
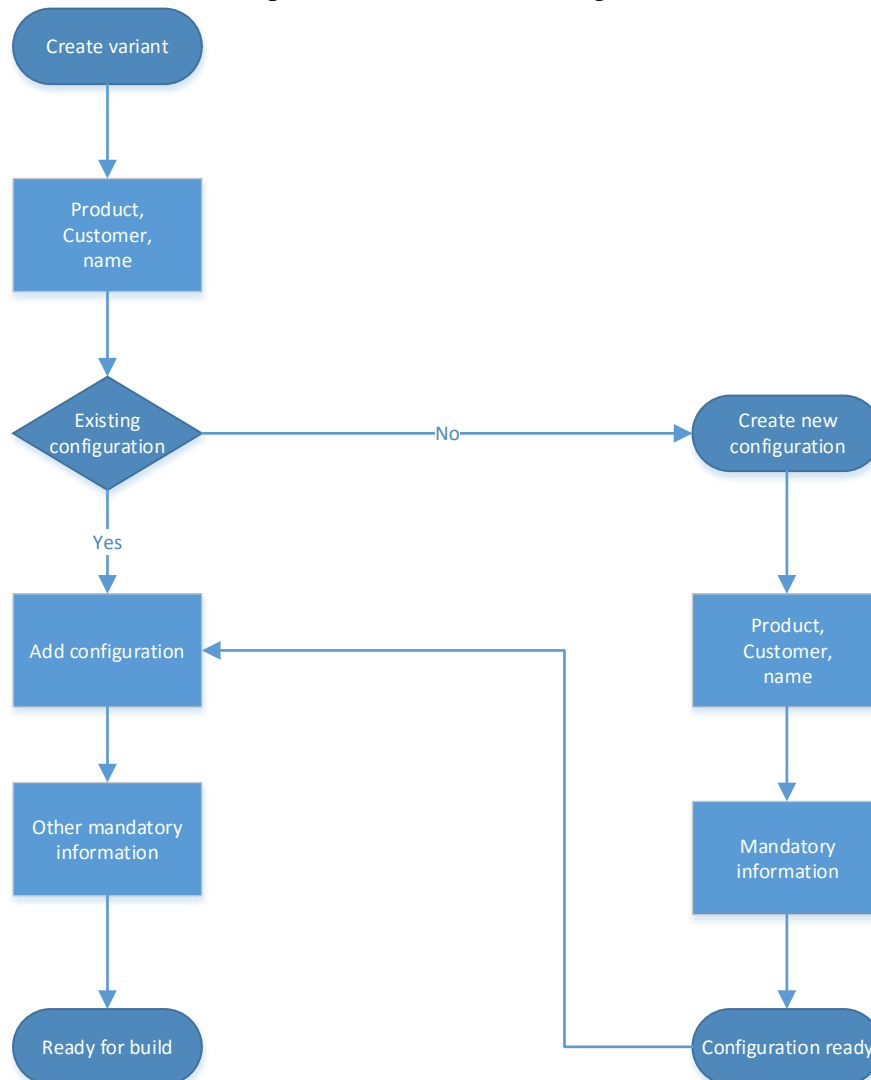
Figure 3.5.2 Variant creation task flow.

The Figure 3.5.2 presents the necessary steps to create a variant:

1. Select product and customers, give a name or use the default generated name
2. Add one or more configurations
3. Add all other mandatory information

Then the variant is ready to be built. The configuration creation task only need to be activated when there is no proper configuration that the user needs. Previously in Nuage, the user has to quit the variant creation process, creates a new configuration and then resume the variant creation task by opening the variant again.

Stage 2: Building

Variant building is a back-end operation. It validates and compiles the settings, attributes and information given by the variant and its configurations. Several build operations can be started at the same time, and each of them usually takes about 2 to 3 hours. Once the build process is started, users can continue working on the same variant or other tasks.

The building operation creates a new object called "variant-build". It is a compressed version of a variant with some back-end settings. Because the build operation is used quite often, I raised it up from one level under variant hierarchy to the same level as variant (detailed in the next section), so that users who are working at the verification stage can use it immediately.

Stage 3: Verify and publish

After a variant is successfully built, it produces a variant-build, from which users can download the E-sample and install it to a device in order to test and verify the software works as expected. In this stage, the subject that users are working on is the variant-build. If users want to modify the variant or the configurations, they have to move to the stage 2.

3.5.3 Redesign from web navigation usability point of view

The navigation usability aspects are the fundamental references I used for redesigning the navigation system of the Nuage website and making the design decisions. In this section, I would like to list these aspects and explain the ideas behind each major change in the design.

I have already briefly introduced the usability testing methods in previous section. Web navigation usability methods have no major differences to those used for the website usability, though some specific aspects need to receive more attention. Based on the aspects used to measure and evaluate the usability of a web navigation listed by Kalbach (Kalbach, 2007), I made some to the list for the Nuage website. The details are described in next sections.

3.5.3.1 *Balance between breadth and depth*

Keep a balance between the levels of website structure and the amount of visible menus in a page (Whitenton, 2013). The amount of levels in the hierarchy structure of a website defines its breadth and depth. Concerning the Nuage website, it is better to widen the navigation categories. so that users can access the actions faster. Therefore, comparing to the old Nuage website design with two major elements, I increased the amount of the first level elements, increasing the tasks types to five.
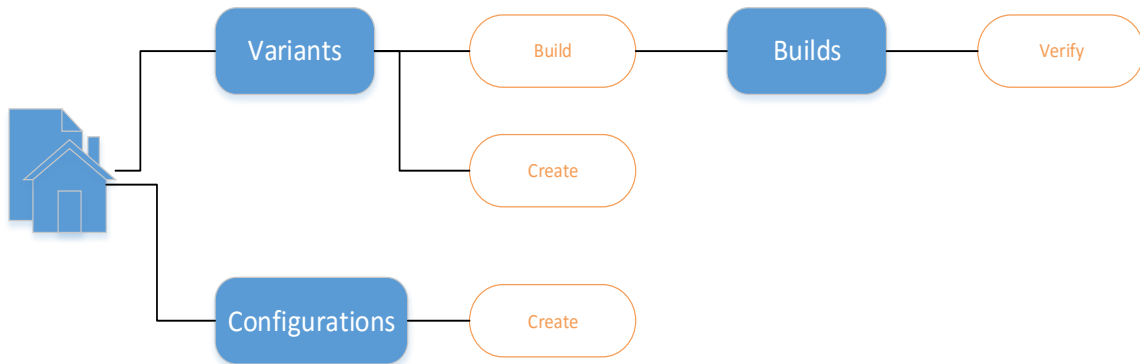
Figure 3.5.3 The old Nuage website navigation structure, in which the "Verify" action needs 4 steps to reach from the home page.
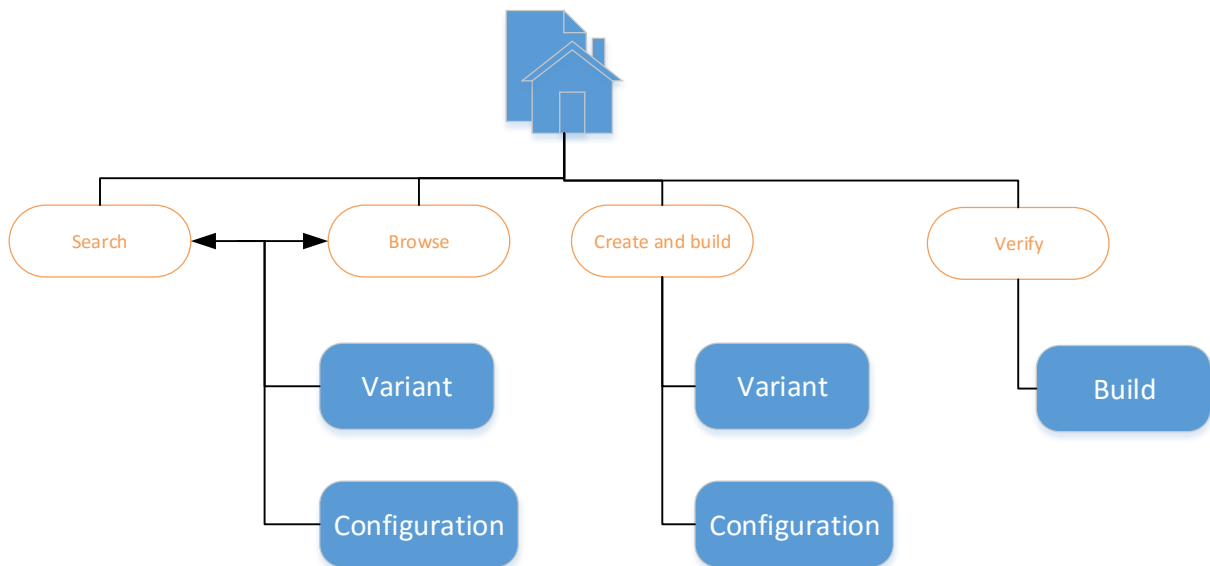
Figure 3.5.4 The redesigned Nuage website navigation structure, in which the "Verify" action can be reached from the home page.

Figure 3.5.3 and 3.5.4 clearly present the differences between content-based navigation and task-based navigation. Figure 3.5.5 shows the old Nuage website with a content-based navigation: for example, if users want to verify a build, they can only find this build through a variant. As shown in Figure 3.3.5, "Build" item and action are located beneath one variant in Nuage, and users are not able to check the build status unless they open the variant and navigate to the "Build and Approvals" tab.
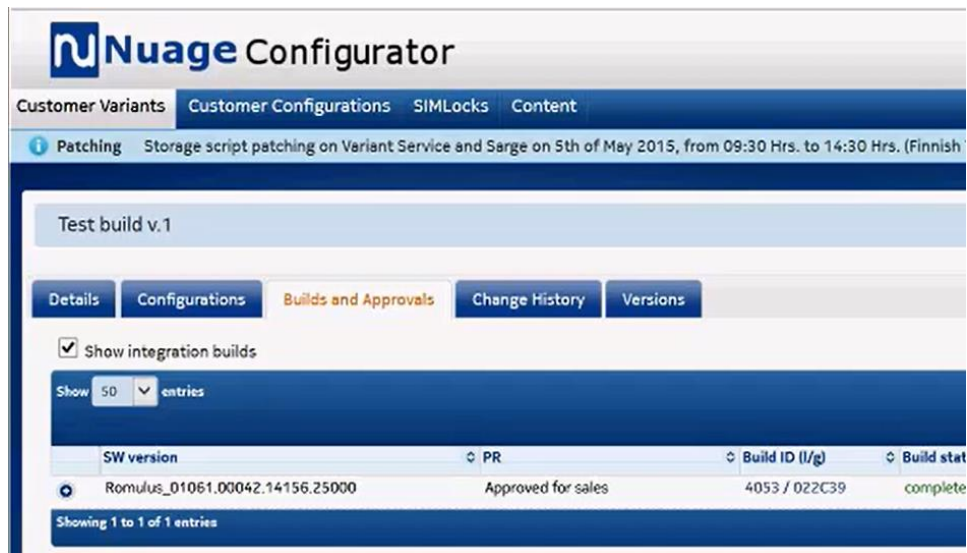

Figure 3.5.5: Content shown to be able to perform the "Build" action in the old Nuage website.

While in Figure 3.5.4 shows that the verification task is in the first navigation level, therefore, users can navigate straight to the build that needs to be verified.

3.5.3.2 Ease of learning

Do users need to learn how to use the website? Even though Nuage is an internal web application, learnability is not as critical as for public websites, it is still very important to make it easy to use for novices and to make the learning process short. The major business benefit is saving the training costs.

The task-based navigation should be able to help in accomplishing this goal, though it remains to be verified via usability testing. In the old Nuage website, users can see "Variant" and "Configuration" in the first navigation level, but they cannot figure out what are hidden behind this level. Moreover, the "Build" task being one of the most important and frequently used tasks is buried under the "Variant" item. It is quite hard for a novice to detect it.

On the contrary, the new navigation has this "Build" task on the first level. Users can start working on it immediately and the corresponding variant that the task is related to can be visible

at the same time. Clearly, with the new navigation design users do not need any training to start working on their tasks.

3.5.3.3 *Consistency and inconsistency*

Navigation elements used in one website should be kept in consistency in style, function and location.

　1. Navigation appears in a steady location. In the new designed Nuage website, there are many different types of navigation and each of them is for its purposes accordingly. As shown in Figure 3.5.6.
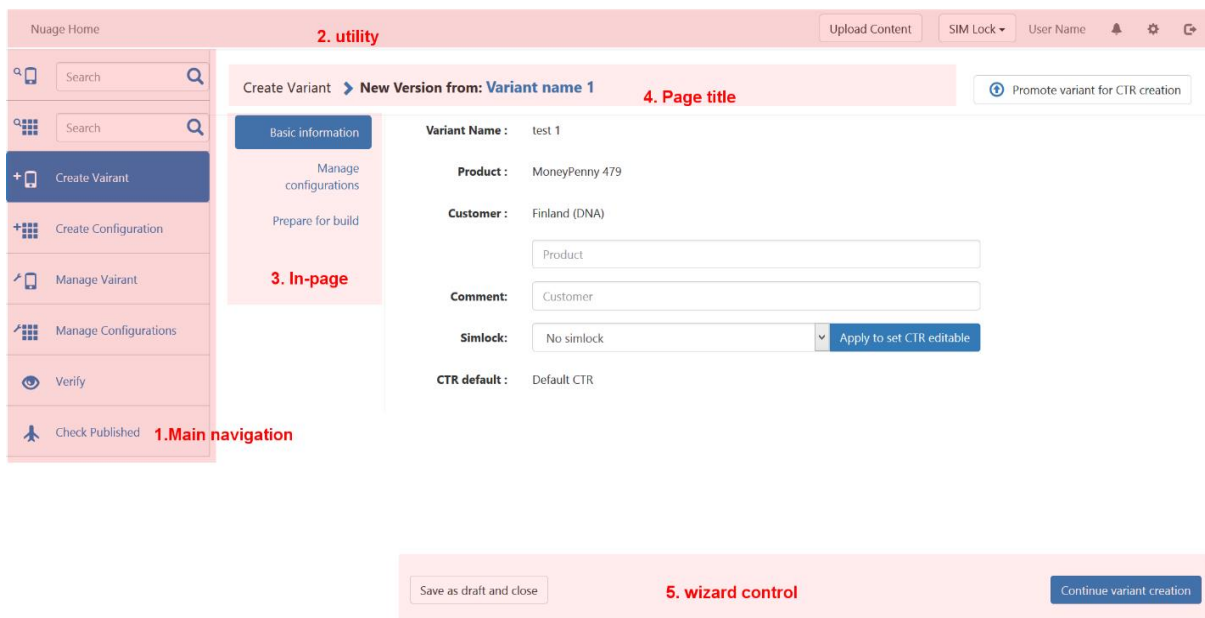

Figure 3.5.6: The new Nuage navigation system

1) Main navigation: It is the main navigation bar sidebar that is allocated at the left side of the page is the. It contains all the major tasks and the task subjects. Each navigation item links to the starting point of each task.

2) Utility: It is also considered as the secondary navigation, which allocated on top of the website. It contains user information, settings, and indication icons. Also, tasks that are asynchronous or not related to the main tasks can start from here, for example, sending a request and uploading content.

3) In-page navigation: when the task has a lot of components, these components are grouped according to their attributes and functions. The in-page navigation links groups of component. This is called in-page because it appears only on some pages

and allows navigation within the page only, and it cannot navigate to the outside of the task section.

4) Page title. The title of a page. It also performs as a breadcrumb to indicate the sub-task from a major task.

5) Wizard control. Contains buttons to guide users to finish their task. Together with the in-page navigation, it allows users to switching.

2. The behavior of navigation is as expected. The buttons and links are indicated as clickable and are responsive to the hover and click events

3. Looks the same across the site, and inconsistency is used wisely. Navigation components should be distinguished from other components, and users should be able to recognize them. However, the new Nuage in-page navigation component looks too similar to the main navigation component. There are some doubts it can be recognized and used correctly, I will find out by studying the usability test.

3.5.3.4 Feedback

As I described in the previous section, users of the Nuage website want to know the result of their tasks and to be informed when something has happened in the background. Proper feedback should help to achieve this goal.

Users should be informed of changes and a process state. One of the major functionality of a navigation system is to inform users where they are, and indicate the process stage of the current task. In the redesigned Nuage website, I would like to achieve this functionality by showing indications on the navigation bar. Also when some component needs a special attention, the navigation item will "blink" with a yellow background in order to attract users attention and indicate that some actions become available. In the new design, the alert appears in page utility bar and the navigation bar as shown in Figure 3.5.7.
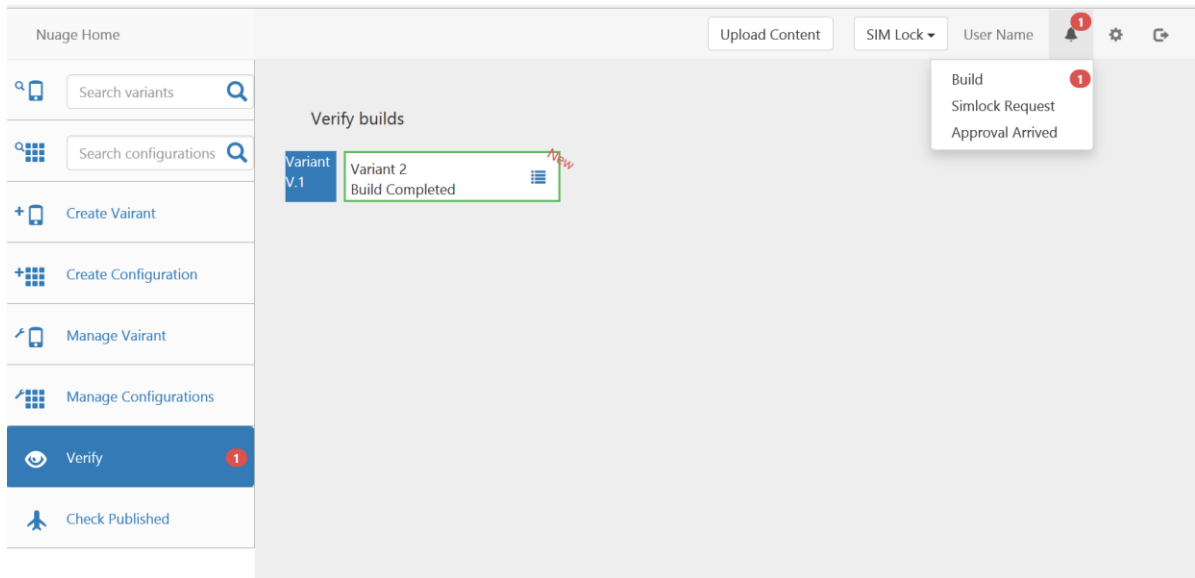
Figure 3.5.7: The notification for "build ready" event.

In Figure 3.5.7, the top-most alert has a flag with number "1". Once clicked on the alert icon, to a dropdown list appears showing the same indicator in the "Build" menu item. At the same time, the "Verify" item in the main navigation bar has the same flag with number "1". Both links to the page where the "Verify builds" is loaded with an item marked as "New". Once the user selects the item or clicks any action from the item's action menu, the flag in both the header and the main navigation disappears.

3.5.3.5 *Efficiency*
Efficiency improvement can be achieved by multiple methods.

Create multiple links to one page. One page can be accessed from multiple places, wherever it is convenient to the user. For example, in the redesigned Nuage website the "Create Variant" wizard page can be accessed from "Create Variant" navigation item, "Create Variant" button from panels and "Add to variant" actions menu, where the last one is a context related action.

Links, buttons, tabs are easy to see and easy to interact with. In the redesign work, I paid special attention to links and buttons. I made sure they can be distinguished from the content and text, and they all have hovering effect. The hovering effect means the mouse cursor changes to hand shape when it hovers on buttons or links. The primary buttons and secondary buttons are distinguished by color. The primary buttons are the buttons that users have to click in order to continue working on the task flow. They have a blue background. In the wizard control buttons (Figure 3.5.6), the primary buttons are always located at the right corner of the page to simulate turning to the next page of a book. And at the end of the wizard page, I use the name of actions instead of "next" or

"finish" to remind to the user about the result of actions. The secondary buttons have a white background, indicating actions that will interrupt the task flow. They are always located at the left corner on the page component.

Also changes in the navigation structure as described in chapter 3.3 can improve the efficiency. For example, "Build" as an important component that was raised up in the navigation hierarchy.

The redesigned menu is shown in Figure 3.5.8, where variant-build item is displayed on the page as a list. There is one variant icon (blue square on the left), on the right of the "build" item indicating the variant and version this build belongs to. Users are able to access the build directly from the home page.
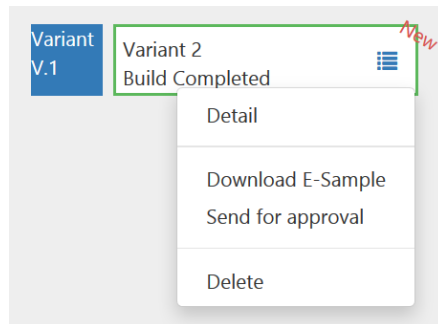

Figure 3.5.8: Redesigned variant build menu

3.5.3.6 Clear labels and visual components

Meaningful names, consistent forms, navigation labels different from other labels. In order to improve the task performance, the label and action should be named as clear as possible to reduce the user's mental processing. I did not hesitate to give long names to the labels and buttons.

Figure 3.5.9: Example of a long button name.

Colors, fonts, layouts are clear and prominent. In the redesigned Nuage, I set a white color to the background and used blue for highlighting in contrast to the old Nuage which looks heavy with the blue background. Also, large enough margins between the elements in a page made them outstanding and easy to focus on.

3.5.4 Other UI element

I designed some extra UI elements for the new navigation concept work. I will introduce these elements in this section.

3.5.4.1 Tile

Inspired by Microsoft's flat design concept (Clayton, 2015), I changed the variant, configuration and build components from the list items to tiles. The main goal of the change was to flatten the navigation structure by providing instance access to a component. Some basic information can be seen from the labels and the actions are listed in the actions menu. Figure 3. 5.10 shows an example of a variant tile.
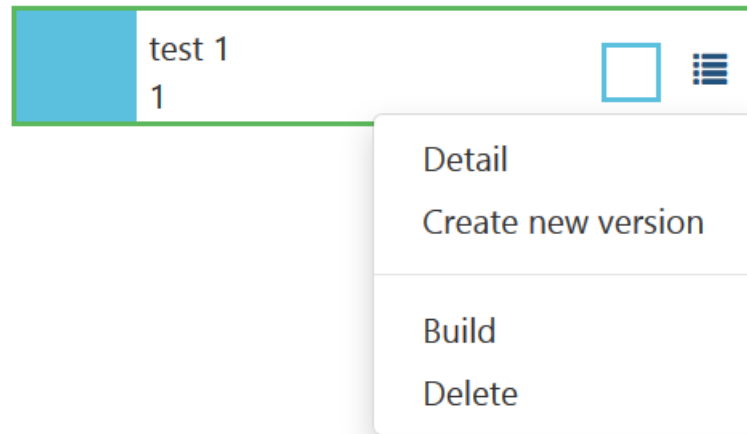

Figure 3.5.10 A variant tile and its context menu.

Tiles are visible from the home page and are grouped according to their types. The benefit is straightforward: users can find out what actions are available in the component and access them easily and quickly.

3.5.4.2 Utility toolbar in the header

The utility toolbar is located on the top of the page and it is always visible. The reason of designing the toolbar is to increase the information visibility and the awareness of the operation progress. This toolbar is used to display asynchronous operations that usually take very long time as mentioned in section 3. Users need to be informed when the operations are. The toolbar is shown in Figure 3.5.11.
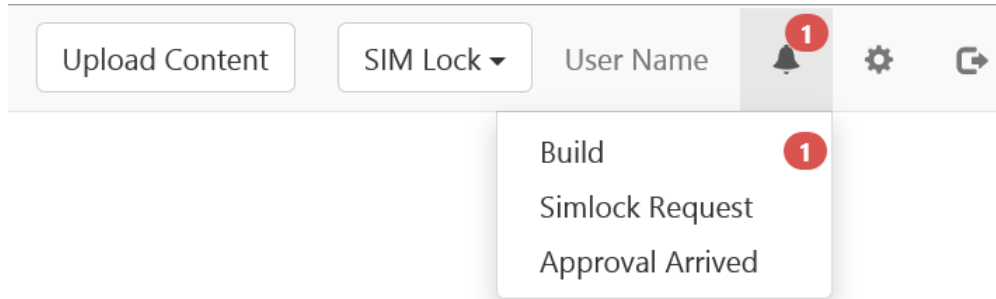
Figure 3.5.12: The utility toolbar in the header.

The toolbar also contains elements to show the basic user account information settings and a sign-off button, as well as action buttons related to asynchronous operation: Upload Content and SIMlock. The dropdown menu is shown when the alert button is clicked. Users can easily see which operation triggered the alert.

3.5.4.3 *Icon assigned to objects*

Icons help users quickly identify the associated content (Barry, 2009).

I assigned an icon to each item, as shown in Figure 3.5.13. Items related to variant actions has a phone-shape icon and items related to actions on configurations has an icon with blocks of small bricks. Additional icons are smaller and indicate a task. The "search" item has a "search" icon and the "create" item has a "plus" icon.
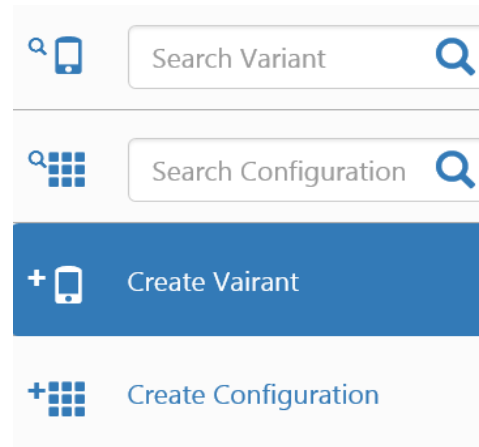

Figure 3.5.13: Items used in the navigation bar.

4 Usability testing

The purpose of the usability testing is to evaluate how much the website, especially the redesign of the navigation system, has achieved the goals as described in chapter 3. In this chapter, I first explain the design of the usability testing, then present the testing result, in the end discuss about the result.

4.1 Participants

I invited 5 testers to participate in the usability testing. This amount of testers should be enough for a qualitative usability testing that should help to discover most of the usability problems (Nielsen, 2001). Among the 5 users, 4 of them were expert users, who had used the Nuage website in daily basis, and one was a novice user, who had received training of the Nuage website but rarely used it. Further, the analysis was more concentrated on expert users, whose experiences were based on different aspects of the Nuage application. The reason to include one novice user in the test was to test the learnability of the new website.

Before the test, I expected the four expert users would have no problem when using the Nuage website and would be able to find the shortest way to complete a task. I planned to check whether they could finish their tasks without instruction when using the redesigned website and whether they followed the old website way of working. The novice user was expected to apply more natural and intuitive way of completing the tasks using both versions of the Nuage website than the well-trained expert users.

Novice users are not typical users for an internal website which are used by well-trained and limited group of people. However, I included one novice user into the usability testing to evaluate whether the productivity can be improved, as pointed by Nielsen (Nielsen, 2006):

Here's how to estimate productivity improvements:

Involve a broad spectrum of representative users (not just experts).
Have the users perform representative tasks (not just a few low-level operations).
Don't tell users how to do the tasks; observe their real behavior.

4.2 Test design

The design of the usability testing is closely related to the target of the website redesign, which was described in the previous chapter. The primary purpose of the usability test is to evaluate how much the redesign has fulfilled the redesign goals. The scope of the test concentrated to the website navigation system. The secondary purpose is to discover the usability problems of the new design. The third purpose is to figure out the differences between requirements from different groups of users.

In each testing session, I played a role as an observer and sat next to the participant, who worked on the tasks on the Nuage website, so that I could see the computer screen. Before every test round started, I explained the test rules and procedures and asked the participant to sign a consent form. The test was recorded with Lync meeting record software. The records included the video of the computer screen and the voice during the test. These records were further analyzed.

There were 3 usability testing rounds for each participant: the navigation stress testing, tasks and the difficulty evaluation after each task, and the navigation checklist review. I explain each testing round in detail in the following sections.

4.2.1   Navigation Stress testing

Navigation stress testing, comparing to other testing methods, is a cheap and quick method to evaluate the web navigation design (Kalbach, 2007). I prepared eight screenshots taken from the deep navigation structure of the redesigned website, removed the color and print them as black and white. Then I asked the participant to select two random pictures and answer to my questions:

- What's the main section of the page?
- Where is a link to the home page?
- Can you see how to exit from this page, how to continue from this page?
- Can you see from where you came to this page?

Analyzing the answers to these questions, expected to figure out:

- Whether or not the navigation is visually outstanding enough to be recognized at the first glance at this page.
- Whether or not the meaning of the navigation items can be understood immediately.
- Whether or not the pages indicate clearly their functions and contents.

This testing method can also help to discover some usability issues.

4.2.2   Evaluation Tasks

The main usability testing included two major tasks: the participant received a list of tasks and did same tasks using different versions of the website: the old Nuage website and the new one. The tasks in the list were focused on the most common use cases. The tasks were divided into four sections: creating, modifying, building and verifying. After each task, the participant was asked to fill a table of difficulty rates to indicate the level of difficulty s/he felt when working on the task.

The following data was gathered from this test round:

- The amount of clicks the participant used to complete a task.
- Whether or not the participant could complete the task successfully.
- Rating of difficulty.
- Comments during the test.

I did not compare the time spent on completing tasks because of the speed of the network connection and the server responding influenced the time spending on each task.

4.2.3 Navigation Checklist Review

The navigation checklist review (appendix 2) method introduced by Kalbach (Kalbach, 2007) is similar to a heuristic review. The checklist he designed specifically for website navigation includes evaluation of navigation, orientation, labelling system, visual design, and browser.

The checklist is filled by a participant every time s/he finished all tasks using one version of the website. The answers were rated from 1 (very disagree) to 5 (very agree), and N/A if users didn't pay attention or didn't know.

4.3 Results

In this section, I first describe the results from test cases done with the old and new versions of the Nuage website. Then I present the checklist results, that participants filled after complete tasks in each version of the website. And at last, I present the navigation stress test result.

The amount of clicks on a participant used to navigate from the starting page to the target page and clicks when navigating between pages were analyzed. I tried to count only the valid clicks and exclude the irrelevant ones from the result.

4.3.1 Warmup tasks

- Task 1: Create a configuration
  Create a new variant for testing. Name the variant as "test 1" and save it as a draft. Find it from the configuration list on the main page.
- Task 2: Create a variant
  Create a configuration named "Configuration 1", and save it as a draft. Find it from the variant list on the main page

These two tasks are warmup tasks, which are considered to be the most basic and easiest tasks, also they are among the most frequently used tasks. The purpose of these tasks is to allow participants to get familiar with the website.

The result shows that all participants were able to complete these tasks successfully. When using the old Nuage website, all expert participants used exactly the same amount of clicks, also followed the same steps. It is obvious that expert users who have been using the old Nuage website for a long time, found the most effective way to finish these tasks using the website. The amount of clicks required to finish Task 1 and Task 2 is 7.
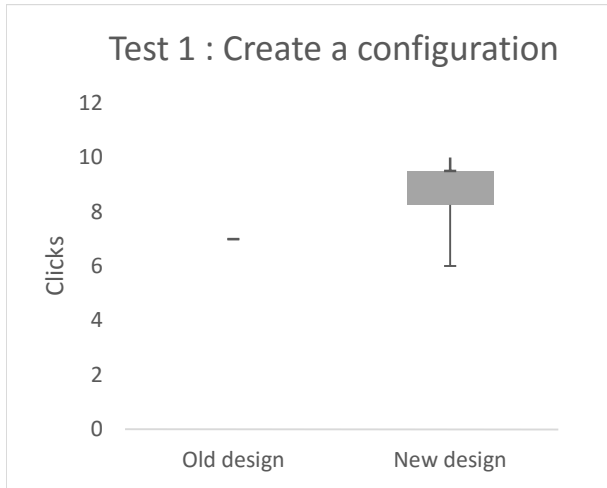
Figure 4.3.1: Task 1

Figure 4.3.2: Task 2

However, when participant did the same tasks in the new design, the amount of clicks used to complete these tasks differed. In Task 1, the minimum amount of click is 6 and the maximum amount is 10, and most of users made 8 to 9 clicks to finish the task. It seems that users were using more clicks to finish the task 1. However, bear in mind, this was the very first-time users had ever seen the new website, thus they used additional steps to ensure the task was done. Result from Task 2 proved that users were learning: the range of click amount was narrower than in Task 1, and users used fewer clicks to complete the task.

Discussion:

The minimum amount of click required to complete both tasks reduced though it took some time to learn the new design. The table 4.3.1 compares the amount of clicks in two designs of the website.

	Old design	New design	Changed %
Task 1	7	6	-14
Task 2	7	6	-14

Table 4.3.1: Amount of clicks in Task 1 and Task 2

Not all participants noticed the primary navigation bar on the left side of the page. As shown in the Figure 4.3.3: there are two ways for variant creation. One is in the primary navigation bar, the other is at the header of the variant list in the middle of the home page

One usability issue was found: button labels in the wizard (Figure 3.5.6) confused participants. Participants saw two options, "Save as draft and close" and "Continue", which made them wondering whether or not the "Continue" would save the current settings, and they might want to click "Save" without closing the current window.
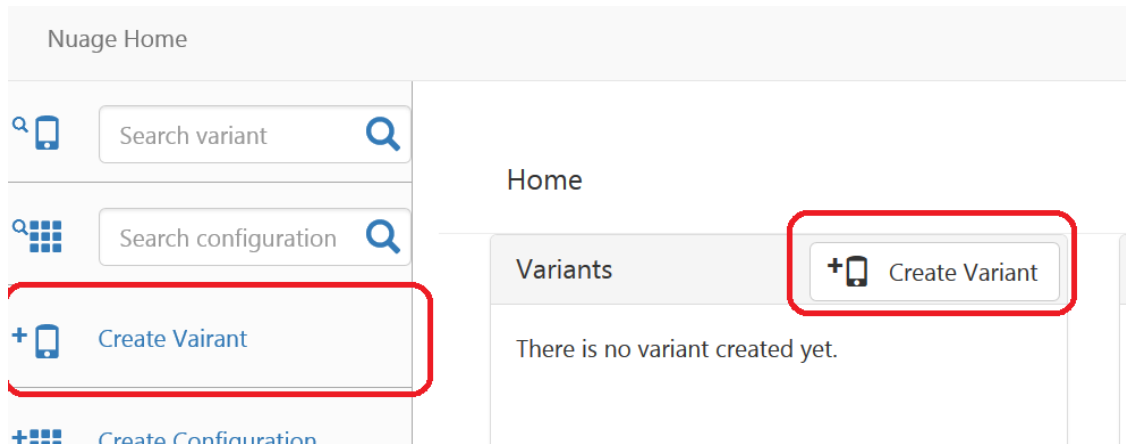
Figure 4.3.3: Two kinds of action buttons for a variant creation task.

4.3.2 Creation tasks

- Task 3: Add one configuration to a variant

  Add one ready-made configuration to the variant "test 1".

- Task 4: Add one configuration to a variant and create a new configuration and add to the variant. Create a new variant named "test 2" from the main page and create a new configuration (any name) for it.

The target of these two tasks is to test whether or not participants are able to modify the variant. In order to complete the Task 4, participants need to enter a subtask and return back to the primary task as described in chapter 3.5.2. In the old Nuage website, the configuration was added to the variant from the page as shown in Figure 4.3.4. There was no option to create a configuration in the page, thus the configuration need to be created in its own page, and users need to navigate between the pages of the variant and the configuration items. The navigation items are pointed by arrows in Figure 4.3.4.
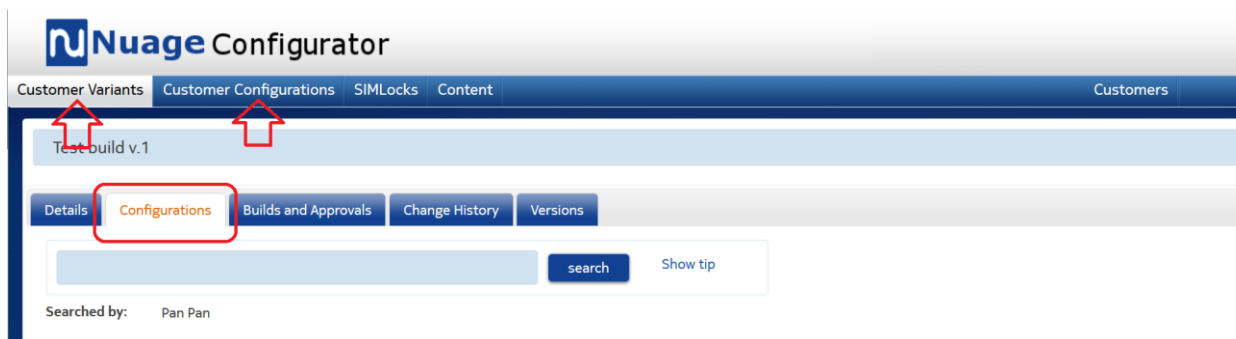

Figure 4.3.4: Page to manage configurations in variant.

When working on these two more complicated tasks, expert participants completed the task in different workflows, one of them made a mistake by clicking on wrong navigation item. Participants had their own different solutions to reach the highest effectiveness. Two participants

opened the variant and the configuration pages in different browser windows, and refreshed the variant page after a configuration in another window was created, so that the configuration list in the page was updated and the newly created configuration appeared there.
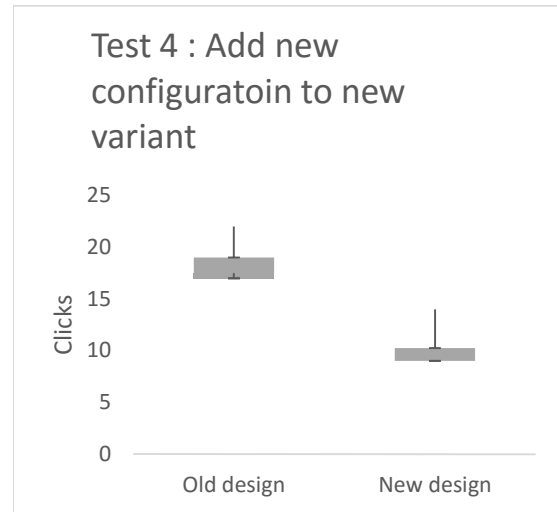

Figure 4.3.5: Task 3

Figure 4.3.6: Task 4

The result shows that in both versions of the website, expert participants were able to finish the tasks by using nearly the minimum amount of clicks, with a few exceptions when users were making mistakes or wondering around looking for the actions to proceed.

	Old design	New design	Changed %
Task 3	11	9	-18%
Task 4	17	9	-47%

Table 4.3.2: The minimum amount of clicks required for Task 3 and Task 4

With the new design the amount of clicks reduced dramatically in Task 4, because participants didn't need to switch between two primary navigation items, and some of the mandatory information were able to be filled automatically according to the context.

Discussion:

Firstly, In the new design, the variant is created using a wizard, which guides users to the sub-task and return back to the starting point. The disadvantage of the solution is that the last action is visible only in the last wizard page. Some of the expert participants dared to try other approaches that they quit the wizard in the middle, therefore they did not reach to the last wizard page.

Secondly, there was one interesting observation made: the labels of wizard buttons were not clear enough to make participants certain about the consequence of their taking the action. There

were quite a few hesitations and uncertainties from participants about what would happen after clicking the button, e.g. would the information be saved or not.

Lastly, one participant did not find the enter point for the subtask, instead she followed the same workflow as using the old website. One of the reasons she did not notice the "shortcut" was because some actions appeared only in the last page of the wizard.

4.3.3 Build and verification tasks

- Task 5: Build the variant
  Build the variant "test 1". Ensure all the mandatory information has been filled in and at least one configuration is added to the variant.
- Task 6: Check Build status
  From the main page, I check the build status of a variant "test 1".
- Task 7: Download E-sample from a build of variant
  Find the link to download the E-sample.
- Task 8: Send for approval
  The build can be sent to the customer. Find the action "Customer approval"

The purpose of these tasks is to test the function of the navigation during the variant build and verify process. Building a variant and getting the result are very important and quite frequently used functions. In Task 5, it is required that the participant should be able to make sure the mandatory information is filled in correctly. In Task 6, 7 and 8, the page layout and navigation should guide participants to check the status quickly, find the E-sample and send it to approval.

As I described in chapter 3.5.4, I designed the indicator system in the toolbar to inform users when a build is ready. I would like inspect whether participants understand it properly with no instruction given.
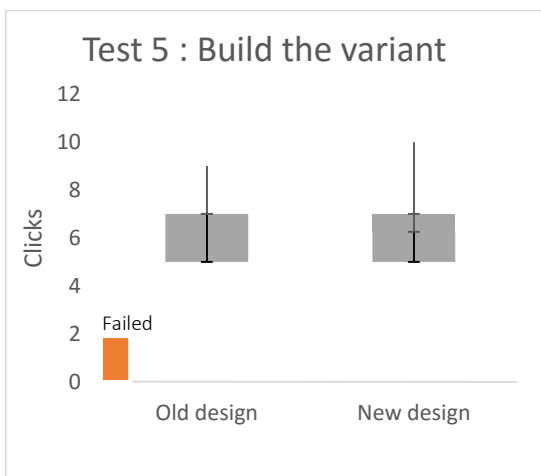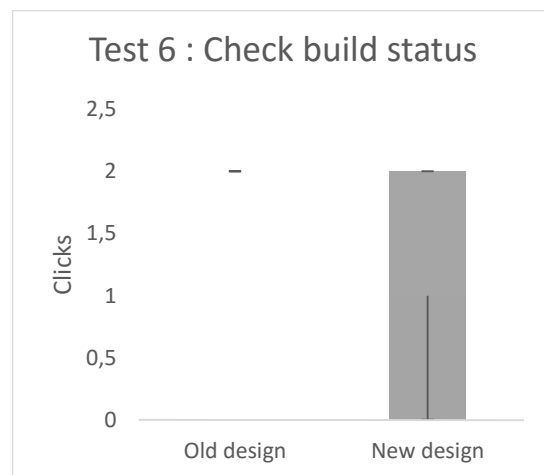

Figure 4.3.7: Task 5

Figure 4.3.8: Task 6

Figure 4.3.7 shows that, participants used about the same amount of clicks to complete the task when creating a build. However, two participant failed to complete this task: the build was created, but the participant did not check whether all mandatory fields had been filled, therefore the build failed in the end.

However, as shown in Figure 4.2.8, the situation is better in the new design. In the new design, participants must navigate to the last page of the wizard to start building the variant, where all mandatory information is listed. As discussed earlier, this is one of the advantages of the wizard. Of course, in this case, the amount of clicks is not reduced as a consequence due to the multiple wizard pages.

The results of Task 6 shows participants checked the build status in the old Nuage by exactly 2 clicks, which is the minimum possible amount of clicks. However, with the new design, participants were able to find the build status using 0 to 2 clicks. As I explained in chapter 3.5, the build status can already be shown in the build tile in the home page, that is why participants can see the build status without making clicks. Some participants who did not notice the status from the tile, found it by clicking the context menu's "Detail" action.

Figure 4.3.9: Task 7

Figure 4.3.10: Task 8

In Task 7, two participants could not complete the task without a help when using the old Nuage. Other participants made 1 to 2 clicks. The reason some participants failed in the task was because they could not find the link to download an E-sample, even though they both knew they should find the link from the variant's "Build and Approvals" tab. As shown in Figure 4.3.11, participants were searching for the link from the action menus on the right side of page and the last column of the table which named as "Action" (marked in green on the right side of the page and the last column of the table). However, the link was actually located in a pop up window which could be opened from a link in the ID column (marked in red in the middle of the table).
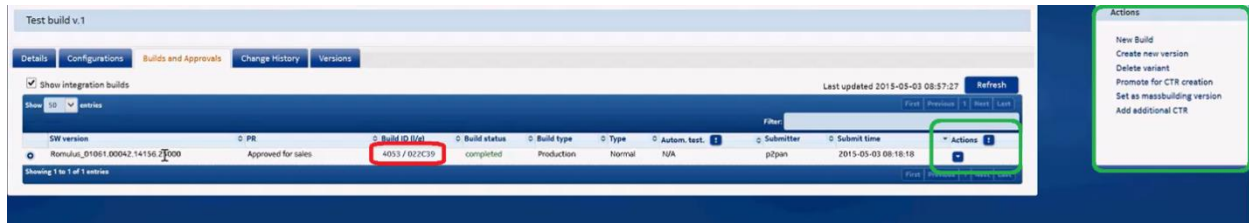
Figure 4.3.11: The old Nuage website's "Build and Verify" tab.

In the new design, participants had no problem to find the action to download an E-sample, because the actions can be found from the context menu. Therefore, all participants were able to complete both Task 7 and Task 8 successfully.

Table 4.3.3 and 4.3.4 shows the amount of clicks used to complete task 5 - 8.

	Old design	New design	Changed, %
Task 5	5	5	0
Task 6	2	0	-100%
Task 7	1	1	0
Task 8	1	1	0

Table 4.3.3: The minimum amount of clicks required for Task 5, 6, 7 and 8.

	Old success rate	New success rate
Task 5	60%	100%
Task 7	80%	100%

Table 4.3.4: Success rate in completing the Task 5 and 7.

Discussion:

As shown in the results, in the new design, all participants could find the required information and perform actions flawlessly.

The indicator in the utility toolbar was noticed by participants, but some expert participants ignored them. On one hand, it means that the indicator did not distract participants from doing their tasks. On the other hand, the indicator was not visible enough because some participants did not even notice the alert icon. After being told about the indicator, all participants liked it a lot.

4.3.4   Utility tasks

- Task 9: Find a variant
  Find a variant using the keyword "test"
- Task 10: Find a configuration
  Find a configuration using the keyword "test"

- Task 11: Reuse the published variant

  Reuse a variant by creating a new version of it.

These tasks are utility tasks, which means they are not critical but good to have features. Therefore, these are not primary tasks, but users do use the features very frequently. The target of these tasks is to check how quick and convenient the access to any object is. In real situation, these tasks are quite often the entry points for users to start their work.

The results are shown in Figures 4.3.12-4.3.14
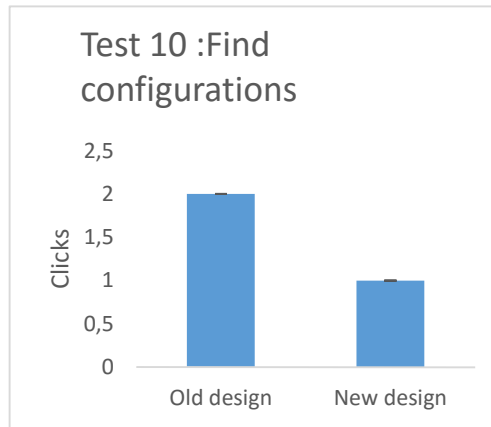

Figure 4.3.12: Task 9
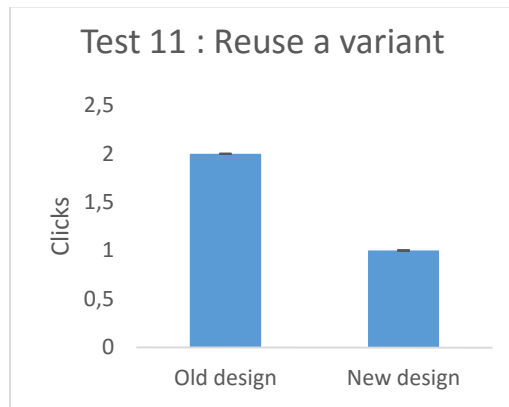

Figure 4.3.13: Task 10

Figure 4.3.14: Task 11

A conclusion can be made based on these results: there are no major issue in these tasks, because no participants encountered any problem doing them in both versions of the website. Participants could easily find the item by using a search. And they knew where to find the action to reuse an object. The only difference was that participants could complete the Task 10 and 11 with fewer clicks using the new design as shown in Table 4.3.5.

Discussion:

Icons in the navigation bar in the new design seems to be indicative. In the search input, I used a placeholder to indicate the component can be searched for. Also, I got feedback that some of the

participants did not read the text, instead they oriented on the icon next to the input field and understood its meaning in the previous tasks. Moreover, buttons with icons are more visible and liked more by participants. Some participants said that the new search design was better because they could start searching immediately.

Once participants were getting used to the navigation items and functions in the new design, they were able to start their tasks from the primary navigation items.

	Old	New	Changed%
Task 9	1	1	0
Task 10	2	1	-50%
Task 11	2	1	-50%

Table 4.3.5: The minimum amount of clicks required for Task 9, 10 and 11.

4.3.5 Stress test

The stress test was run before the participants have seen the new design of the website. The feedback they provided was based on their first impression, which allowed me to evaluate the user's understanding on the navigation's visual presentation and layout logic.

From the stress testing, I found that in most of cases, participants could find the navigation component they were asked. Some issues were identified from the stress test. An example of the web pages used in the stress testing is shown in Figure 4.3.14.
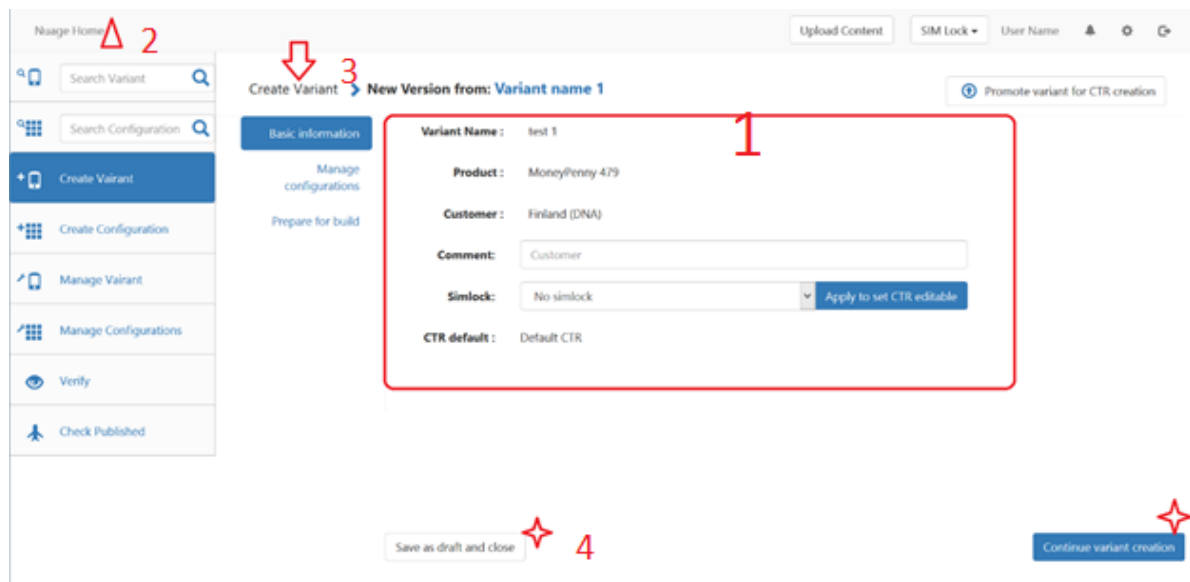

Figure 4.3.14. One of the wizard page used in stress testing

This page shown in Figure 4.3.14 is captured from the variant creation wizard and it represents most of the problems found in the stress test.

1. Participants could not identify the main component of the page. The main section is marked by the rectangle. The area excludes the vertical in-page tab navigation on the left side.
2. Participants could not identify the link to home page. "Nuage Home" button, marked with a triangle, is not outstanding enough to be seen instantly. Thus, participants thought the homepage was the one highlighted in the side navigation bar. However, the same participants had no problem to find the home button during the testing.
3. Participants could not discover the hierarchy of the current page. The arrow points to the upper level from the current page. However, it was not clear enough to users.
4. Wizard buttons were seen in the stress testing but not during the task testing. Some users claimed that they didn't notice the white button when doing the task, but all users found the button in this testing section.

4.3.6 Task difficulty rate

Participants were asked to evaluate the difficulty of each task by filling the task difficulty form after completed each usability test. Since the quantity of the participants was very small: 5 persons in total, the task difficulty rate appears to be less valuable comparing to the evaluation task. Despite that, I present the test data and its analysis anyway because it shows a general feeling of the participants about the new design.

First, I checked if there are relationships between the easiness of a task and changes in the amount of clicks made. Then I compared the data gathered from the novice participants and expert participants, then shortly discuss the differences.

There is one data need more explanation: in the result the higher the rate is, the easier the participant think the task is.
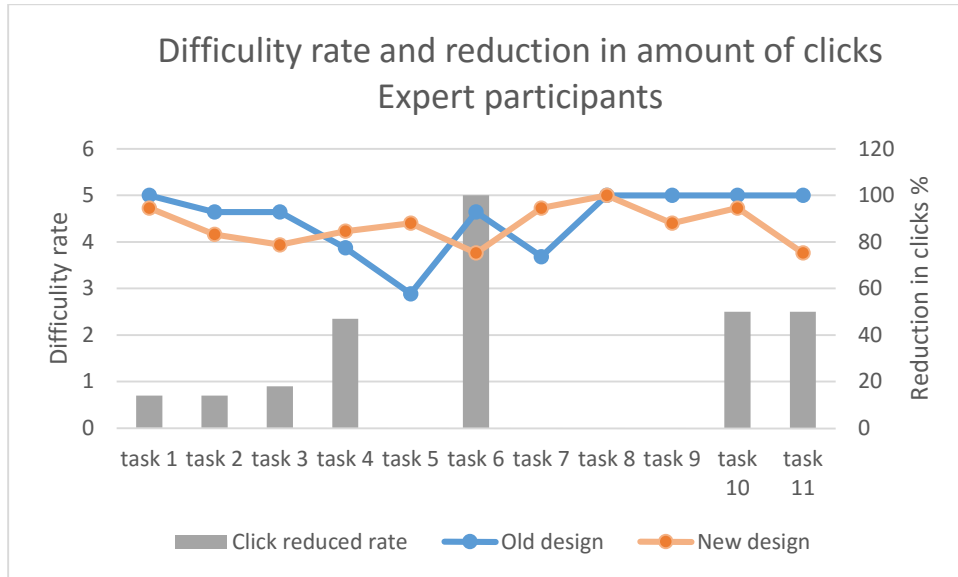
Figure 4.3.15: Rate of difficulty of the expert participants and the reduction in the amount of clicks. The higher the rate is, the easier the participant think the task is.

Figure 4.3.15 shows that, in average the old Nuage website was quite OK for the expert participants. Expert participants were trained well and got used to the system. Thus, they did not think that finishing the tasks was difficult. However, some of the tasks were considered to be quite difficult, for example Task 5, which failed two participants. The difficulty evaluation result shows that even expert participants agreed that some tasks were difficult.

The difficult rate of the new website does not differ much from the old one. Expert participants did not accuse to any tasks were very difficult to complete. Bear in mind, that they were using the new website for the very first time without receiving any instructions. It means the new website can be learnt and used flawlessly. Some signs showed that expert participants were so used to the old way of completing tasks and were not adapted to the new design: for example, many participants did not use the alert notification on top of the page because there was no such a utility bar in the old website and they did not look at the top area of the page at all.

The reduction in click rate does not seem to influence much the general user experience. Probably, the content of the task was more important, like how data can be saved.

In general, there is little different for expert participants in using the old and the new website as long as both websites can provide the data they need. On the contrary, for the novice participant, the difference is quite obvious, as shown in Figure 4.3.16.
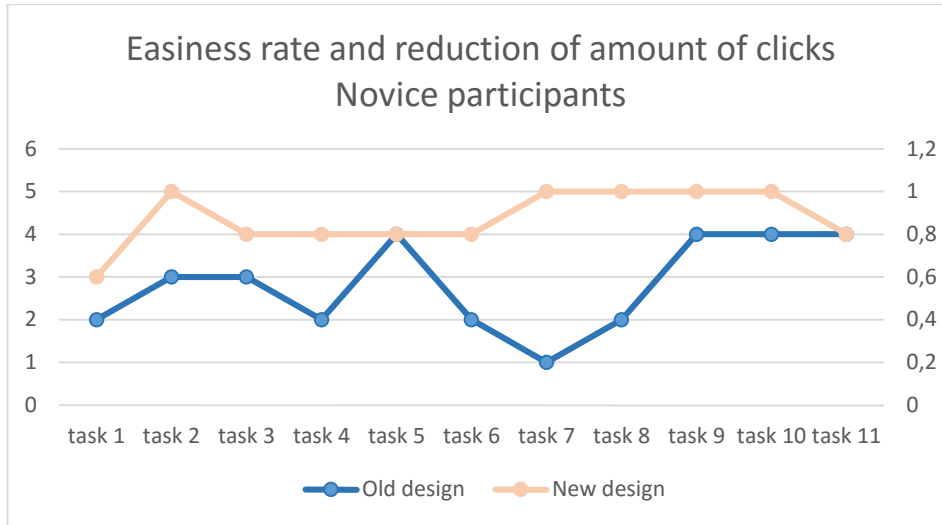
Figure 4.3.16: Difficulty rate for the novice participant

Figure 4.3.16 shows that the novice participant thought the new website was easier to use than the old one: almost all tasks in the new design were rated as easier than the old one except two tasks were rated as equally difficult.

It is important to point out that the novice participant could use the new design website to complete all tasks with no training at all, but could not successfully complete all tasks use the old Nuage website even though the participant had received some training. Therefore, it is obvious that the new designed website can shorten the learning period quite much.

4.3.7 Navigation evaluation checklist

In this section, I present the results from the navigation evaluation checklist. During the test, some participants did not fully understand some terms used in the checklist, so I had to explain them. Still, some terms left misunderstood.

The navigation evaluation checklist was filled by each participant after finishing one test round doing tasks on one version of the Nuage website. The checklist listed features that a good website navigation system should contain, then participants decided whether or not they thought the feature was used in the website. The higher the rate is the more features are used in the website navigation.
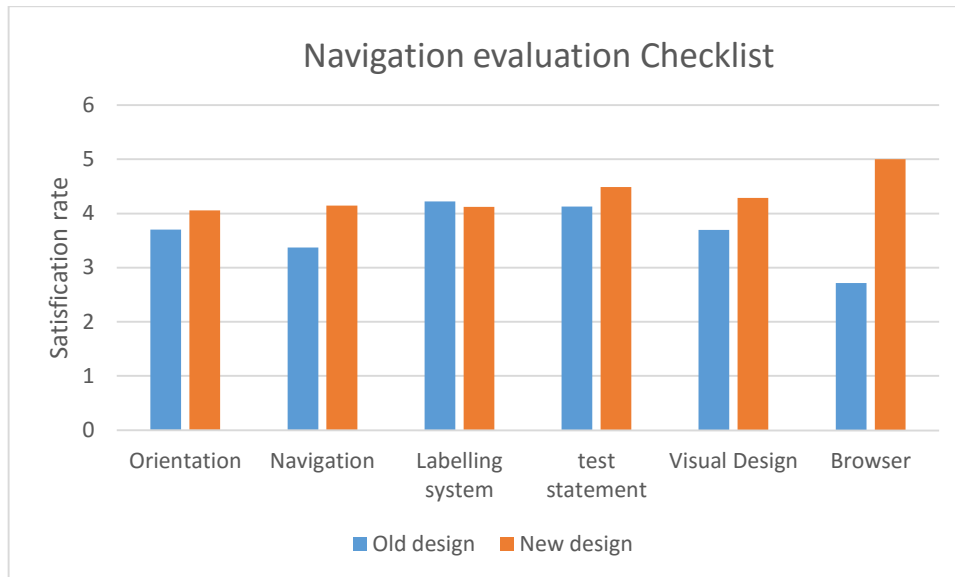
Figure 4.3.17: Navigation evaluation checklist result

As shown in Figure 4.3.17, the new website is in general rated higher than the old one. There is only one element in the new design rated lower than the old one, that is, the labelling system. It was analyzed in the previous section as well, that the most problematic component are the wizard buttons. For example, the button name "Save and Close" confused participants, as they started guessing whether the information would be saved if this button was not pressed.

4.4 Discussion about the usability testing

The usability testing not only revealed problems existing in the new Nuage website design, but also proved there are benefit that a task-based navigation can bring to the Nuage website usability.

On one hand, the new website is not perfect and there are problems. For example, the labelling system was not understandable instantly, the wizard did not improve the efficiency of expert users, the notification was not noticed by users.

On the other hand, the new website design was rated positively and recognized as easier to learn and easier to use. More importantly, it proved that the new website design could be more efficient in most of the user case because it could reduce the amount of efforts to complete a task.

The design of the usability test itself also has a large room for improvement: some tasks required only 0 to 2 clicks to finish, which produced too little data to be analyzed and compared. In future, I should plan the tasks with more careful design.

5 Conclusions

The purpose of this project was to evaluate the change in usability that task-based navigation can bring to content-based navigation in a website by running an experiment. The experiment was conducted by redesigning the Nuage website navigation system from being content-based to task-based and running usability tests in order to evaluate whether or not the new design was more efficient, easier to use and bringing more business value. The usability results show that the task-based navigation system has the following advantages:

- The task-based navigation is more intuitive and users can complete their tasks without instructions.
- Tasks are visible on the page, and users can start working on the tasks immediately.
- Task originated pages can guide users through all the necessary steps, which is useful when there is mandatory information users need to take care of.
- The flat navigation layer reduces the number of steps required to complete a task.
- The indicator system can help users to be aware of the background change and react with actions.

As discussed in section 2.3.2, task-based navigation is like a double-edged sword. At the same time, there are aspects that need to be carefully considered when designing the navigation in order to meet the requirement of expert users:

- A task originated wizard needs to be smarter so that expert users can manage a shortcut to complete a task faster when they know what they are doing.
- The design of the navigation could be challenging for expert users who are working on more complex tasks and dealing with a larger amount of data.
- Different user groups may prefer different tasks. Therefore, task-based navigation needs to be more versatile to fit users' requirement. This will require a lot of effort to design and test.

It should be noted that due to the limited resources the project still has room to be improved. Firstly, this experiment was conducted based on a demo website that is far from mature with very limited functionalities. Secondly, while the sample of users involved in the usability testing is too small to make any generalization, the results reveal personal opinions. In addition, it is important to emphasize that methodological problems in the usability design discussed in section 4.4 limit the value of the study.

In general, the experimental project concentrated on the website navigation and compared the two versions of the navigation design and brings some thought to people who might face a similar situation. The new website design was rated positively and considered to be more user-friendly

than the old one. Participants liked the quick access to actions, the task status indication, and the appearance of the page.

Now I have deeper understanding about the advantages and disadvantages task-based navigation can bring to the Nuage website. In the future, I am hoping to spend more time on designing the website: improving the information architecture, fixing usability problems, adding data handling, analyzing user tasks, as well as studying more user groups and use cases.

I have learnt a lot from this project and experienced many challenges and much excitement. Finally, I hope that this work can provide design ideas not just for the future Nuage website but also bring values and inspirations to persons who make design decisions in selecting between task-based and content-based navigation.

References

Barry, N. (2009, March 3). *How To Use Icons To Support Content In Web Design*. Retrieved from SMASHING magazine: http://www.smashingmagazine.com/2009/03/03/how-to-use-icons-to-support-content-in-web-design/

blog, b. C. (n.d.). *7 Good Reasons to Redesign Your Business Website.* Retrieved 2 1, 2015, from http://bmighty2.com/7-good-reasons-to-redesign-your-business-website/

Cheetah, D. (n.d.). *Why Redesign?* Retrieved 2 1, 2014, from http://www.digitalcheetah.com/?nd=redesign

Chelsea, B. (21014, 6 26). *Website Redesign Victory: A Step-by-Step Guide.* Retrieved 2 10, 2015, from http://blog.crazyegg.com/2014/06/26/website-redesign-guide/

CHI. (2004, October). *SUMMARY: Topic-based navigation vs. task-based.* Retrieved from osdir.com: http://osdir.com/ml/web.chi-web/2004-10/msg00038.html

Chris, G. (n.d.). *An Introduction to Evolutionary Site Redesign with WiderFunnel's Blog.* Retrieved 2 27, 2015, from http://www.widerfunnel.com/case-study/an-introduction-to-evolutionary-site-redesign-and-widerfunnels-blog-redesign

Clayton, S. (2015, 4 30). *Modern design at Microsoft -Going beyond flat design*. Retrieved from Microsoft: http://www.microsoft.com/en-us/stories/design/

Davis, N. (2012, 8 6). *Creating a Web-site Information Architecture in Six Steps.* Retrieved from UX matters: http://www.uxmatters.com/mt/archives/2012/08/creating-a-web-site-information-architecture-in-six-steps.php

Davis, N. (2013, 11 1). *Information Architecture: Beyond Web Sites, Apps, and Screens.* Retrieved 1 28, 2015, from http://www.uxmatters.com/mt/archives/2013/11/information-architecture-beyond-web-sites-apps-and-screens.php

Foraker Labs. (2015, March 2). Retrieved March 2, 2015, from Usability First: http://www.usabilityfirst.com

GROUP, N. N. (2014, 2 23). *Intranet Information Architecture (IA) Trends.* Retrieved 1 31, 2015, from http://www.nngroup.com/articles/intranet-information-architecture-ia/

Ian, M. (2014, 8 20). *5 Important Reasons to Redesign Your Website.* Retrieved 2 1, 2014, from http://www.huffingtonpost.com/ian-mills/5-important-reasons-to-website-design_b_5510439.html

Jakob, N. (2009, March 23). *Mega Menus Work Well for Site Navigation.* Retrieved from Nielson Norman Group: http://www.nngroup.com/articles/mega-menus-work-well/

Kalbach, J. (2007). *Design Web Navigation: Optimizing the User Experience.* California: O'Reilly Media.

Nielsen, J. (1995, Jan 1). *10 Usability Heuristics for User Interface Design.* Retrieved June 1, 2005, from http://www.nngroup.com/articles/ten-usability-heuristics/

Nielsen, J. (2000, March 19). *Why You Only Need to Test with 5 Users.* Retrieved from Nielsen Norman Group: http://www.nngroup.com/articles/why-you-only-need-to-test-with-5-users/

Nielsen, J. (2001, January 21). *Usability Metrics.* Retrieved from Nielsen Norman Group: http://www.nngroup.com/articles/usability-metrics/

Nielsen, J. (2006, October 23). *Productivity and Screen Size.* Retrieved from Nielsen Norman Group: http://www.nngroup.com/articles/productivity-and-screen-size/

Nielsen, J. (2009, 5 11). *Top 10 Information Architecture (IA) Mistakes.* Retrieved from Nielsen Norman Group: http://www.nngroup.com/articles/top-10-ia-mistakes/

Peter, M., & Louis, R. (2007). *Information Architecture for the World Wide Web: Designing Large-Scale Web Sites.* O'Reilly Media, Inc.

Thomas, C. (2012, July 9). *An Introduction To Website Usability Testing.* Retrieved March 1, 2015, from http://usabilitygeek.com/an-introduction-to-website-usability-testing/

Usability. (2015, February 13). (Wikipedia) Retrieved March 1, 2015 , from http://en.wikipedia.org/wiki/Usability

Usability testing. (2015, March 2). (Wikipedia) Retrieved March 2, 2015 , from http://en.wikipedia.org/wiki/Usability_testing

Usability.gov. (n.d.). Retrieved 3 1, 2015, from http://www.usability.gov/what-and-why/glossary/u/index.html

W.Eugene, T., & Technologies, P. G. (1999, 3 8). *Web Navigation - How to make your web site fast and usable.* Retrieved 2 6, 2015, from http://zing.ncsl.nist.gov/hfweb/proceedings/tiller-green/

White, M. (2014, Janary 9). *Task-Based or Topic-Based Navigation?* Retrieved from Navigation arts: http://blog.navigationarts.com/task-based-or-topic-based-navigation/

Whitenton, K. (2015, 1 4). *Top 3 IA Questions about Navigation Menus.* Retrieved from Nielsen Norman Group: http://www.nngroup.com/articles/ia-questions-navigation-menus/

Wikipedia. (n.d.). *Information architecture.* Retrieved 1 31, 2015, from http://en.wikipedia.org/wiki/Information_architecture

Wurman, R. S. (1997). *Information Architects (1st ed.).* Graphis Inc.

Appendix 1: User's wishes

	Wish	Subject	action	Amount
1	Relevant to me	Anything	Search	1
2	Division	Test / Real Variant	Search	1
3	Predefined (default)		Search	2
4	Be notified when	Build	Is Ready	8
		Changeset	Approved	
		Variant	Released to factory	
		Maintenance break		
		New SW	release	
		Updates in common Configurations		
		To be deleted variants/products		
5	See My	Item changed history My latest Variant, Build RFU/OTA SWPP Configuration Statues change Latest release Mass build		9
6	See my	Saved/bookmarked Items Followed Modified Most visited		10
7	download	e-sample	Quick access	1
8	Everywhere	Main action: Create variant Create Configurations Add new app	Accessible	2
9	Possibility	Order notifications Change email settings		1

Appendix 2: Navigation usability check list

Scale 1 to 5

1	2	3	4	5
Very disagree	Disagree	OK	Agree	Very agree

Put N/A if not know

1.

Test statement	Rating	Comment
Orientation		
The scope of the products and services is visible from the home page		
The function of main navigation mechanisms is clear at a glance		
Location within the site is shown on each page		
Global navigation appears consistently throughout the site		
Navigating		
All major parts of the site are accessible from the home page		
Critical content is located high in the structure of the site		
Content is within three clicks of the home page		
Alternative navigation mechanisms are available		
An exit point appears on every page		
Further navigation suggestions on every page apart from a global navigation		
Related information is linked together		
Navigation links behave consistently and predictably		
Labeling System		
Links are labeled accurately with mutually exclusive terms		
The language used is simple and in terms that site visitors can understand		
The meaning of navigation options is clear, consistent, and useful		
The destination of navigation links is predictable		

1.

Test statement	Rating	Comment
Abbreviations are not used; or, when used they are clear and obvious to target audiences		
Each page has a clear page title related to other labels around it		
Visual Design		
Navigation options are clear and visible		
Navigation options are readable and quickly scannable		
There is a clear visual hierarchy of options, labels, and headers on each page		
The navigation mechanisms are pleasing and attractive		
The layout is clear with a sufficient amount of white space		
Colors are used effectively to prioritize and organize navigation		
Browser		
Back buttons and other assumed browser functions are operable		