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# The design and development of a web application to improve business processes and performance in an innovative media company: a case study of JS Suomi Ltd

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The design and development of a web application to improve business  
processes and performance in an innovative media company: a case  
study of JS Suomi Ltd

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Web applications are nowadays easy to apply and use, and their scalability for organizations is vast. The purpose of this project is to assist a sales department of JS Suomi by organizing and categorizing information about their previous customer projects with a web application. It was hoped that the project would deepen understanding of the benefits of the product of JS Suomi from a client perspective and collect data about successful customer implementations.

This report focuses on the application that was developed mainly for sales people in the new customer acquisition department in JS Suomi whose target group is limited companies. JS Suomi produces a particular type of brochure, electronic and printed.

The reports begin by explaining the applications benefits to the company and how the use of customer references in sales situations is useful.

The application is an information technology infrastructure library project which contains selected reference brochures of the case company with appropriate information about them. Displaying customer cases is crucial information to be distributed to all workers who wish to understand marketing needs of different industries and broaden their understanding. The application explains why and how a customer was able to implement a JS Suomi product and what were the benefits of it. This type of information can assist a salesperson to customize a sales pitch according to industry.

Brochures used in marketing are aimed to help in gaining customers. However, for the application to be useful we need to get into the details; How the brochure helped the company, where it was used or what was the specific impact of the brochure in a sales situation. Such information would help sales personnel to remember individual success stories and prove a working concept to a customer much easier by using customer references in the right way. An important aspect of effective sales is understanding the customer and creating value with the product.

The application was also developed to counter the shortcomings of a brochure database of the mother company of JS Suomi Ltd, which contains all published brochures. In addition, the report explains in detail the steps that lead to the development of the application. The report defines frameworks used to develop it and which programs were used to design and build the front-end side of the application.

After the application had been free for the use of the employees for a short period, it was implemented into a training program for the newcomers who start in the new customer acquisition department and is in free use for all employees. However, it was mainly developed for the sales department whose target group is limited companies.

Keywords: Database, User Experience, Unique Selling Point, Web Accessibility, Web Application

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## Acronyms

USP	Unique selling point
NACE	Statistical Classification of Economic Activities in the European Community
CRM	Customer relations management tool
CSR	Corporate social responsibility
SME	Small medium size organization
CMS	Content management system
DMAIC	A concept in six sigma; define, measure, analyze, improve, control

## 1 Introduction

This thesis paper covers the process of developing an information technology infrastructure library application for a Finnish media company to display selected brochures the company has produced to different businesses as marketing tools over the past ten years. The report explains the importance of the use of references in sales and how the project was created. It also covers all the tools and frameworks which have been used to create the front-end driven application.

The project was important for the company due to limitations of the existing tools provided by the mother company of JS Suomi. The mother company cannot offer tailored solutions to all challenges the office in Finland faces, such as updating and modifying the content of a database which contains all the customer references of JS Suomi.

Developers of this application used waterfall methodology along with other web development technologies which are clarified further in the report to develop this application.

According to Andy Ingham, a senior digital designer, nowadays applications must follow a user-centric design and user should understanding of the functionalities of an application through graphical design (Ingham, ei pvm). For this reason, the application is focused on having an easily approachable interface. Later in this report is explained what tools were used to design the interface, which has received positive feedback from the company for well-designed graphics. The company found the results of this project useful.

This thesis paper focuses on why the application would be helpful to the company and what kind of benefits it brings. These benefits have been discussed and agreed on with a representative of JS Suomi. Furthermore, the theoretical frameworks which were applied for building the application are explained. The theory part is followed by an explanation of how the application was designed, which is perhaps the most significant section of the thesis, hence crucial considering the application. In the last parts of the report, the deployment and maintenance of the application are covered with few final words.

## 2 Company background

JS Suomi is a part of a media group that is operating in 9 countries altogether. It originates from Denmark where the office has been operating for over 20 years now. JS Suomi has founded nine years ago and has been taking ever since a strong foothold in brochure publishing industry around Finland. It was first operated and managed from an office in Sweden until the company was mature enough to take care of itself in Finland. JS Suomi operates throughout the whole country. It has around 50 employees of which three to five personnel are part-time workers.

### 3 Company operations

The company produces multimedia brochures as its main product. The company has 6 different departments: Project consultants, Key account managers, Advertisement sales department, Office assistants including quality control, Production and Administration which includes HR and financial control. The chain of responsibility of a project has a following flow in departments:



Figure 1: Company operation steps

After the brochure is finished the client is in most cases transferred back to a project consultant or key account manager, who can later start a resale with the old customer.

These departments work closely together. Project consultants are considered as the first step in customer chain. For example, book a meeting for a key account manager who meets the potential customer. The project consultant needs to brief the key account manager before the meeting. The better the agenda of the meeting is the more likely the key account manager will be able to bring a contract. This is why project consultants and key account managers especially need to communicate and talk about the customer and share ideas. These two departments are required to co-operate possibly the most between all



departments. After a contract is made the key account manager delivers a list of possible advertisers, which is received often from the customer. The list is given to quality control and if its approved the office assistants fill in the missing information such as phone numbers, addresses and other contact information of the potential advertisers.

After the assistant is finished, the list is sent to advertisements sales department where another sales person is appointed for the project. From that point on the Project consultant and Key account manager must again work together and brief the appointed sales person for the project. They usually exchange ideas about the project on how to approach the possible advertisers who would fund the brochure.

After the funding is finished, the project is transferred to production. The advertisement sales department should communicate with the production team and make sure that the advertisers deliver their material for the advertisements which is later added to the brochure. In case the advertiser doesn't have any proper material, an art director will help them to produce it.

After all the advertisements have been delivered to the production the project is in the hands of a production team. The team consists a project leader, an art director and a copywriter. The production takes from four to six weeks. On the basis of interviews and production meetings with a customer the copywriter writes the texts and the project leader forms the layout. After forming the layout, the first draft is sent to the customer and the brochure is modified until the customer has accepted the final product.

#### 4 Objectives of the project

The thesis project is aiming for developing a useful tool for project consultants and key account managers to learn about the needs, uses and themes of several carefully selected brochures and increase the performance of sales people in situations where a customer needs convincing, or a sales person needs proper references to approach a client. According to the sales department, often when a sales person wants to approach a potential customer one should have already an idea what the customer might need. The application allows the salesperson to select few example brochures which can be used as references in a sales pitch. Therefore, the brochures that are placed in the application are examples of particular theme or industry which previously had been used in a project and had significant benefit for the customer according to the sales report. Moreover, the application gives the interesting story on how a client used a specific brochure which it helps the salesperson use that as a reference for future projects. The aim, however, is not to replace the existing database which mother company has provided but to offer an easy access and clear information about a brochure which the main database cannot deliver.

Furthermore, examining the main database of the mother company showed that the database provided does not work outside of the office reliably. As a result, users can not access the

database during the customer meeting or while working out of office. The application can be useful in a difficult situation when for example a client is unsure what kind of brochure they would need or would deny the necessity of marketing as a whole. From a perspective of several project consultants who were involved with the application and provided much information about the company processes for developing it, this happens in fact quite often in some industries. According to JS Suomi sales report, it is hard to find real evidence for the lack of interest in marketing especially for small construction companies, but empirical evidence seems to the point that this is true.



Figure 2: Company operation flow

For the customer meetings selecting the right references are important. It plays a significant role in convincing a client. According to the company guidelines, a good set of rules for selecting brochure references are when one is selected from the same industry as the potential customer. One from the same area for the potential customer to feel safer to discuss with a sales person from JS Suomi and one brochure of a company which is similar in size to the potential customer (size in revenue or workforce). The Application could help in the selection process.

Also, the objective of building this application is to enable the salesperson to share the report and feedback of how a client was able to benefit from a specific brochure after using it for

some time. Hence, the information helps to identify where and how the client was able to use the brochure. Perhaps the customer was able to acquire a number of clients by using the brochure in a way which personnel in JS Suomi would not have imagined. Sharing this information helps the salesperson to showcase or choose a suitable brochure for future customers.

## 5 Beneficiaries and benefits

It is important to plan who would benefit from the application, so that the case company is able to understand the need for the application and encourage workers to use the it. By interviewing the sales manager of JS Suomi became clear, what type of employees would be able to benefit from the application and how the application would assist them in their sales activities.

### 5.1 New employees

The training cycle of a single worker in a sales oriented organization can be short and the sooner the person can become a profitable unit for the company the earlier the company starts making up the time spent on training the new hires that accumulated from training the person. This applies to JS Suomi after interviewing the sales trainer of the company. The application provides a tidily arranged information about different industries and how to sell for each industry. The sales trainer explained that a new hire first learns the product. Once the newcomer passed the training and learned the product, he can start applying the product knowledge to different industries. At this point the application should become useful. Various industries have a need for different kinds of brochures. A new employee can view from the application what to expect from a company of certain industry and apply the information to a sales pitch.

### 5.2 Personnel who wish to understand different industries

The company has customers in many industries. According to the sales manager, sometime a single sales person, even more experienced ones tend to prefer industries only from few sectors. That might work for an individual but the ultimate goal, according to the sales manager, is that every employee would be able to handle and have knowledge about all the major industries JS Suomi serves and understand their marketing needs. Furthermore, the company wants to improve its personnel.

#### 5.2.1 Easy to forget

With a huge amount of brochures produced, it is easy to forget the best customer cases, especially some that are few years old but would still be relevant today. The aim of developing this application was to help and enable the users to preserve customer cases which were successful as an epitome into the application as references.

### 5.2.2 Repetitive sales

When a business can multiply an implementation with many clients which are similar to each other, the company grows from it. The application is aimed to highlight the successful implementations which then again could be repeated. The new client acquisition department should benefit from this information so that the end user can understand the necessary USP<sup>1</sup>'s of the product. "Customer tend to like nothing better than being offered successful solutions and identifying those solutions being provided to similar organizations" (Rickard, 2015; StatCounter, 2017).

## 6 Identifying the problem

Currently, the Danish mother company of JS Suomi provides a reference database containing all the brochures in electronic form. JS Suomi office has read permissions but no writing permissions for the database. After the brochure is ready, the production team can send information about it only once, which will be then added to the database. The problem is that the information is not always relevant for sales people. The company also receives a lot of information about the project from the customer after they have used it for some time. This information is often worth of sharing, and it cannot be written to the reference database of the mother company.

The web application is contributing to the primary database. In the application, it is possible to write the relevant information about some of the customer cases. New hires for sales department do not know about the client cases, and more experienced people can also use it to learn about others' clients, not only their own. The company produces hundreds of brochures yearly, and it is difficult to keep up with the important ones.

When discussing with the sales personnel of JS Suomi, they brought up that brochures that open up, for example new customer segments or interesting themes would be necessary knowledge for everyone. It was explained that the business lives from inventing new reasons to produce brochures for organizations. If the company can share a new idea around the sales personnel and replicate the sales process with a customer segment, the company has again space to grow and expand.

Since the amount of the brochures is huge in order to build the application, sales people need to point out the best cases they use in sales activities. These cases are preferably typical examples of such brochures as well as some special cases of different theme and industry.

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<sup>1</sup> Unique selling point

## 7 Application logic and categories of brochures

The application is following a logic where a user needs to select the brochures according to a NACE code of industries or by the theme of the brochures. The logic of the application should have very low skill level requirements for using. A user should be able to browse the application even with little of the experience of using an internet browser. This selection logic also aligns well with the CRM<sup>2</sup> tool of the company.

### 7.1 Brochure NACE codes

NACE code is a statistical classification of economic activities. NACE codes group organizations into categories according to their business activities. It is a standard used in Europe. JS Suomi uses this specification to identify different needs of companies and to which type of industries the product can be applied to. In the application, the brochures are categorized also according to NACE code. From the application development discussions with sales representatives of JS Suomi became apparent that it is important for them to know what type of industries are the best prospects for the company. The same categorization criteria is used in the CRM tool of the company. Therefore, the personnel are already familiar with it.

Typical industries to which JS Suomi provides services are:

- Manufacturing
- Gas, electricity production
- Water and waste management
- Construction
- Wholesales
- Transportation
- Information technology
- Other professional, scientific and technical activities
- Accommodation
- Education
- Healthcare

### 7.2 Brochure themes

Another categorization criteria in addition to NACE code is the theme of the brochure. It is important to acknowledge that companies in different industries prefer to use certain themes in their marketing materials. These themes were thought up with few senior sales personnel when being interviewed concerning the requirements of the application and what information it should contain. According to their experience, for some companies profiling is important and some only use references to boost their marketing and sales. Companies listed in the

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<sup>2</sup> Customer relation management tool

stock market, for example, have more of a tendency to use profile brochures whereas for a small company profiling is not important.

Here is listed some of the themes of the brochures:

- Profile brochure
- Services brochure
- Product portfolio
- Reference brochure
- CSR<sup>3</sup> brochure
- Anniversary
- Export
- Guide
- Recruiting

According to the sales manager of JS Suomi, these are typical themes and understanding what works for which industry and size of a company, are necessary knowledge for sales people in JS Suomi. Also, not to mention that it is not possible to find brochures according to their theme from the database of the mother company. Currently information about themes of the brochure is relying only on individuals who remember the customer case. In the application is also a brief explanation for each theme. According to the interviews with the sales personnel, construction companies for example use reference brochures whereas subcontracting companies in manufacturing would need to bring out services more than references. Businesses that are operating in energy or waste management prefer typically express their concerns for nature and explain about new operations that are ever more environmentally friendly. The brochure type could be called as “green values” or “environmental values,” and sometimes this is a part of their CSR profiling. Companies which have a similar field of industries are placed in the same theme. For instance, companies working in the energy sector and building biofuel power plant can be categorized in the same theme as both can be considered as ecological.

### 7.3 Application logic

The application is categorizing brochures according to brochure themes and NACE codes. The user can then select from either source. The aim is partly to learn that what kind of themes different industries are using in their brochures. The logic of the application is described in the following figure. This figure was also used when the application was described to the case company after interviewing the requirements for the application.

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<sup>3</sup> Corporate social responsibility



Figure 3: Application logic

## 8 Thesis product

### 8.1 High level objective

If a sales person understands more industries, it will be beneficial for the whole company. A famous quote of Jack Welch the CEO of General Motors “Change before you have to” would be a useful guideline. If a company keeps on drilling the same industry or the same customers the income can be depleted. In JS Suomi the sales cycle could be described in following way:

- Prospecting
- Planning and preparing
- Approach Presentation
- Handling objections
- Closing
- Follow up

The cycle before the company can establish a new project with a customer can be very long due to many reasons. According to the sales personnel, the main reasons for this are the lack of need for a new brochure and the type of funding that is used to produce the brochure, which is often not possible to repeat in short gaps. Therefore, it is utmost important to look for different opportunities in all kinds of industries. The more industries one can cover with a product the more playfield there is. For this reason, the thesis application should also highlight newly emerged business areas.

#### 8.1.1 Sales is personal and extremely difficult

When an idea must be sold, concept or product and the tools to achieve this are plain emails and phone the task is sometimes close to impossible. By getting close to even having a conversation, the interest of the opposite side needs to be awakened very fast. The right references can help. Most times it is helpful to have reference brochures from the same industry, competitor or a company from the local area. This contributes to having the right impact to the prospect, and he might spend a minute or two listening what a salesperson has to say. Even so, helps more if a salesperson knows already what kind of brochures the company in the case is typically using.

The application is useful also when a salesperson needs to change a sales pitch to fit for the company in question. Most company personnel and especially in the management complain the amount of contacting of different sales organizations. The more a salesperson can customize a pitch to fit a company and directly offer what they need the more a potential customer will usually listen.



Interestingly not every company would want to profile themselves as the very best in the field or the highest quality. After interviewing a customer of JS Suomi, a CEO of an SME<sup>4</sup> size construction company, who regularly drives a BMW but while visiting customers or suppliers drives with a Toyota Hiace, does not want to look too prestigious for them. Furthermore, when JS Suomi produced a brochure for the company, instructions were not to make it look good but average and a “bit rough around the edges” as he described. It was the belief of the CEO that the more successful they looked, the more money their suppliers and subcontractors would demand and the fewer customers would be willing to spend if being provoked with wealth and success by driving for a visit with an expensive car. Hence should be kept in mind that every company is also an individual with individual needs and purposes. The ultimate goal for JS Suomi is also not to produce what is ultimately the best, but the best for a customer. This is important to realize when selling tailored solutions to companies and is one reason more for salespeople to familiarize themselves with previous customer cases; why was a brochure made the way it is, is a key for understanding the needs of companies.

## 8.2 Requirements for building the application

The requirements for building the application are free disk space and Chrome or IE installed on every computer. Not many resources needed for the application since web developing is free. If JS Suomi wants to take the application to online or on a mobile platform, then more resources will be needed. For now, the application is offline and most likely it is not required for online use, even it was suggested by some workers. For later development, a CMS<sup>5</sup> implementation might be useful, but for that, some basic applications for WordPress might be needed to be installed on the company computer.

JS Suomi had its administrators visiting from the mother company who were installing new servers and had rights to install applications to the company computers. By default, the company does not allow anything to be installed on the computers but IT administrators were flexible concerning code editors as long as it would be beneficial. The rules are very restricting in many respects but still necessary since they prevent installation of unwanted software. Even with very limited resources and tight security, it was possible to develop the application because disk space is not an issue nowadays and most web applications can be opened with a browser.

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<sup>4</sup> Small medium size company

<sup>5</sup> Content management system

### 8.3 Application interface and function

The application displays the brochures in categories which open by clicking any of the categories. Under the category is a dropdown, which contains the brochures and the dropdown closes when clicked again or by opening another category.

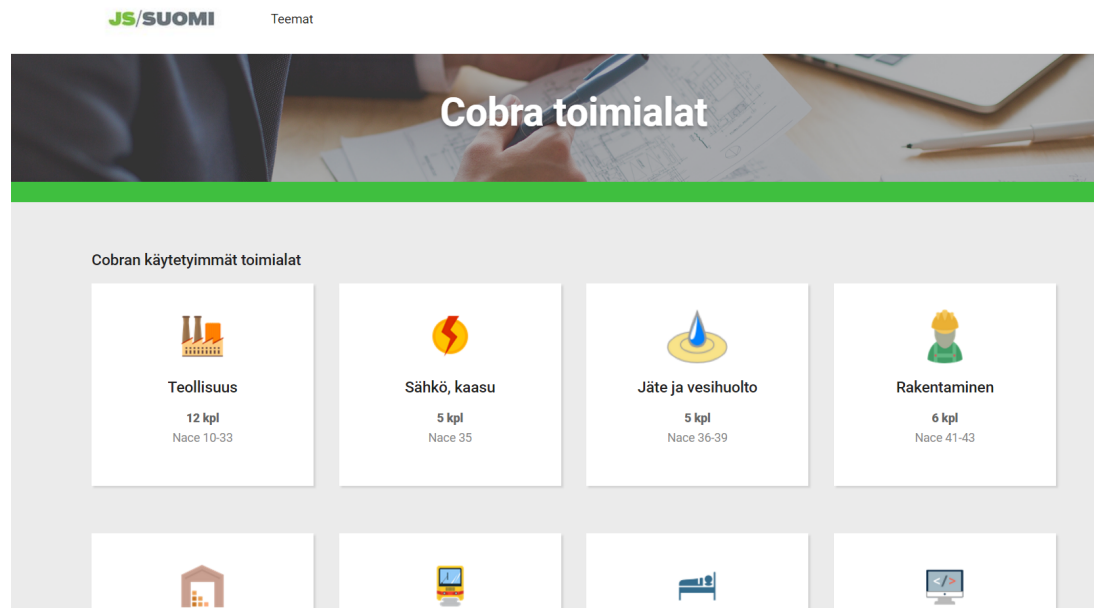


Figure 4: Application interface 1

This is the view for the NACE code based selection of brochures. The view for theme based selection is a dropdown on the top of the page and by selecting a theme the application displays brochures accordingly in a different view.

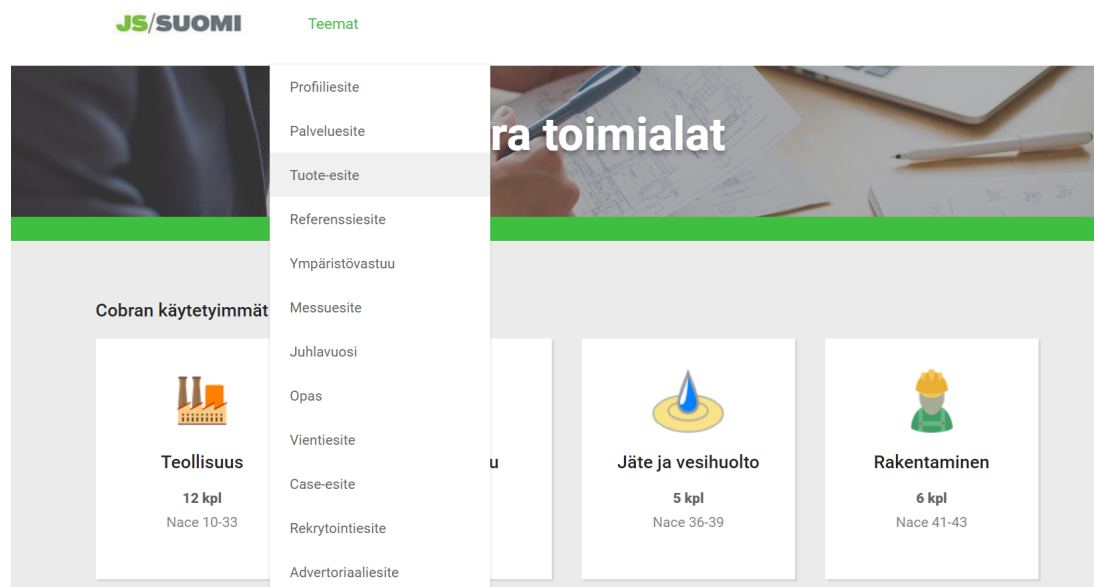


Figure 5: Application interface 2

In the NACE view, the dropdown is marked with an accordion tag. There are altogether three accordion tags which have their own row which work independently.

There are four categories in each accordion which is marked with a “href = collapse” -tag designated for that specific dropdown.

The data-toggle automatically turns the <div> element into a collapsible element. Data-toggle is a bootstrap framework element.

```

229
230 <div class="row">
231
232 <div class="col-md-3 col-sm-8" data-toggle="collapse" data-parent="#accordion" href="#collapse0" style="cursor: poin
233
234 <div class="box"> 
235
236 <h4>Teollisuus</h4>
237
238 <strong>12 kpl</strong>
239
240
241 <p>Nace 10-33</p>
242
243
244 </div>
245
246 </div>

```

Figure 6: Dropdown from bootstrap framework

Following code displays the first accordion which has the first collapsible category with an id “collapse0”

```

292
293 <!-- first category-->
294 <div class = "container">
295 <div class="panel-group" id="accordion">
296
297 <div class="panel panel-default" id="test">
298 <div id="collapse0" class="panel-collapse collapse">
299
300 <div class="panel-body">
301 <div class="col-xs-6 col-sm-3">
302 <img src = "esitteet/24/rautavalimo.jpg"></div>
303 <div class="col-xs-6 col-sm-3">Uudenkaupungin rautavalimo
304 Toimitusketjun esittely suunnittelusta, materiaalihankinnasta loppukuljetukseen. Uusiasiakashankinnan työväline
305 </div>
306 <div class="col-xs-6 col-sm-3">
307 <img src = "esitteet/25/valkonmetalli.jpg"></div>
308 <div class="col-xs-6 col-sm-3">
309 Kertoo yrityksestä ja siinä tapahtuneista muutoksista. Tämän lisäksi tuodaan esille palveluita, referenssejä j
310 Jakelu: tuulivoiman, mineraali- ja kaivosteollisuuden, energia-alan ja potkurilaitte-, meri- ja offshore-teolli
311
312 </div>
313 </div>
314 <div class="panel-body">
315 <div class="col-xs-6 col-sm-3">
316 <a href="http://www.esitteemme.fi/finnsonic_fi/DemoView" target="_blank"> 
318 Nostetaan yrityksen arvoja, brändiä, namedropataan merkittäviä asiakkaita, kustannustehokkuutta, kestävyyttä j
319
320 </div>
321 <div class="col-xs-6 col-sm-3">
322 <a href="http://www.esitteemme.fi/alupro2/DemoView" target="_blank"></a></div>
323 <div class="col-xs-6 col-sm-3">
324 Asiakas valitsi meidät koska halusivat korostaa omia kumppaneita oman brändin kulmakivenä. Antoi
325 ilmoitusasiakkaille koko sivun bannerin hinnalla. Toimitusjohtajan mielestä projekti oli vaivatton ja tuotanto
326 jouhevasti vaikka hän oli ainoa joka projektia hoiti.
327 </div>
328 </div>
329
330 <div class="panel-body">

```

Figure 7: Collapsing element of dropdown

## 9 Theoretical frameworks

### 9.1 Waterfall

The following section describes the theoretical model that was used as a guideline and framework for building the web application. It proved useful for keeping the progress of the project in order. The objectives of every step became clear when the project was put in a framework.

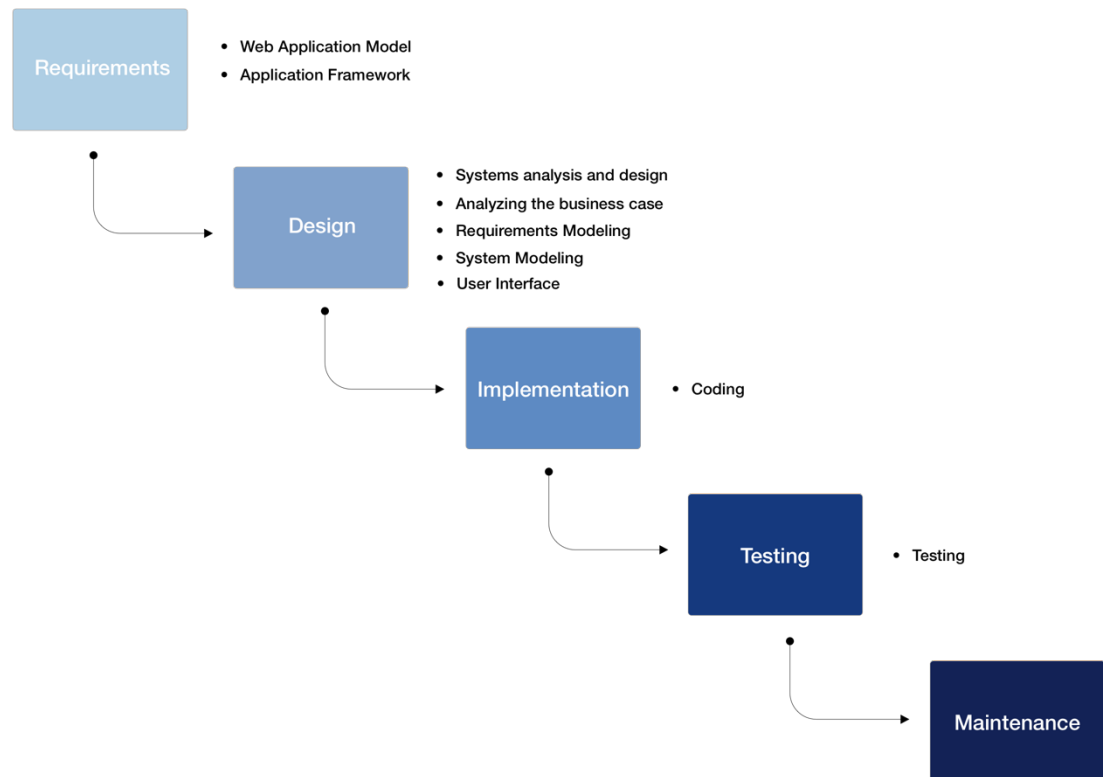


Figure 8: Waterfall methodology

The project objective was first to build a quick solution to the problem which would give a better idea of what are the real objectives and problems the application should counter. Feedback and discussions with the sales team of JS Suomi made possible the finding of the right solution. Therefore, it was decided that waterfall framework would be the best method to approach the application since the requirements were already discovered. “Waterfall is efficient and effective for products that represent minimal design and engineering complexity, or that are cookie-cutter implementations of well-understood solutions” (Anderso;McRee;& Wilsons, 2010).

Waterfall method is a plan driven method where every step of the way is planned beforehand. The plan for the application always made progress in discussions with the end users. The method is then executed in orderly fashioned by building the application step by

step. A waterfall method consists of seven steps: System requirements, Software requirements, requirement analysis, program design, implementation, testing, and launching.

Often waterfall includes a beta version of an application which is an early version of the final product which has some of the functionalities as the final product would have but still has bugs to fix and does not necessarily function properly. This project also had a beta version which is showcased later in the report.

On the other hand, it could also be argued that the framework was a scrum with only one sprint in between the beta version and the final version of the application. However, monitoring progress in milestones when developing the application was the most helpful aspect of the waterfall framework and the known requirements.

A beta version of the application was implemented in few weeks after the agreeing on the requirements with the customer company, which was not as suitable as the final version but had some of the same properties. The beta version, however, was a good foundation to develop the final version and with discussions and feedback sessions after the releasing the beta version the requirements became apparent.

## 9.2 ITIL (Information Technology Infrastructure Library)



Figure 9: ITIL

ITIL is a framework where IT services are standardized or improved for businesses. The goal of ITIL project is to improve the efficiency of the business and develop best practices in a company. ITIL came from the 80s when first data centers were built. In this case, it is created to improve a business process and continual improvement of sales personnel. ITIL framework is not a fixed rule book. It can cover many business areas. The idea of ITIL is that its structure

can be built to serve many different circumstances and almost any IT department can apply its principle. The aims from ITIL perspective:

- The services are described better in customer language and in more appropriate detail
- The organization develops a clearer structure and becomes more efficient and more focused on the company objectives

### 9.3 ITIL project in six sigma

When the application project is described in ITIL framework in a context of six sigma, the life cycle of the application from start to continuance turned out clear. This helps to control the quality and follow-up of the project. Six Sigma is used mostly in production to control quality by minimizing defects in products or services, but its principle in continuous improvement is a good concept to apply to ITIL projects as well. By pairing them, IT projects can be found to be more efficient for business activities. New ITIL projects are always aimed to improve a business process by managing its content. “It can be simply put that ITIL defines “what” of IT service management and Six Sigma defines the “how” of quality improvement” (Jha, 2017).

#### SIX SIGMA(DMAIC<sup>6</sup>)

#### ITIL

DEFINE	Identify the possibility to improve a process. Define what is measured (Discussions with sales people of JS Suomi how the application would be assist them). This phase includes identifying the problem
MEASURE	Gather data and process it (Gather all the relevant brochures we want to include in the application)
ANALYZE	Analyze gathered data and present it (Build the application pilot and present the gathered data for piloting version of the application)
IMPROVE	Confirm the usefulness of the project. Verify the benefits of the ITIL project for business process and that the piloted solution can be refined into an application

<sup>6</sup> Steps to improve a business process; define, measure, analyze, improve, control

CONTROL	Implement the application and control it by adding more content (Add customer cases to the application and optimize the data to improve the application and thus improve the business process)
---------	---

Table 1: Table of ITIL project in steps of six sigma

## 10 Knowledgebase & Requirements

In this phase, all the theories and concepts that the web application design and graphics are based on, are explained. These include overall web application model and application frameworks.

### 10.1 Web application model

A web application is a program that exists on the server and runs using a web browser, through a web page. Furthermore, a web application is similar to a desktop application which it is created using a combination of programming languages and web application frameworks.

RAM (Random Access Memory) can be implemented in a web application and allow user interactivity. For example, Google Mail is an online application where users can make changes while using it at the same time.

To distinguish web application from dynamic websites, can be said that the web applications are based on user engagement, and almost all their contents are from the end users. Furthermore, web applications are similar to desktop applications in a way that they are more complicated and need more skills than websites do. On the other hand, dynamic websites allow the users to interact too but creating the content is dominant.

### 10.2 Application Framework

Application Framework is set of libraries and classes which provide built-in generic functionalities. Application framework deals with standard low-level details of a working system. For example, a web framework can provide functionality for authentication in request handling and state management.

Application framework can be thought of as a reusable software environment. AngularJS, Apache Flex, Net Framework, and Spring framework are examples of application frameworks.

A framework operates as a template for an application. It can be modified by writing additional code; extra code changes callback procedures and objects behavior using inheritance thus producing a specific application. The main advantages of application frameworks are:

- Provides built-in functionalities; allows an easier development of application systems.
- Reduces overall development effort and time; developers can focus on writing codes just for specific application requirements.
- Allows applications to be implemented with a standard structure which improves their maintainability.

## 11 Design

In the design phase of the development process, an abstract representation of how the application works were created. Designing before developing an application is similar to an architectural plan for a building, which gives detailed information of each component and helps the developer to understand the workflow. Therefore, during this phase, every requirement has been taking into consideration such as user experience, user interface, and functionality.

### 11.1 Systems analysis and design

System analysis and design refer to the process of examining a previous system used by a company with intent to enhance procedures and methods (Gupta & Malik, 2005). System analysis and design helps to understand various parts of a system and analyze the performance of its components. The phase creates following benefits:

- Appropriate measures to study the problems of the organization.
- Help to simplify the task and increase system efficiency.
- Appropriate measures to assist the salesperson in decision-making and productivity
- System analysis and design can help to create more efficient organizational structure and procedures
- Accessing accurate and opportune information.

Moreover, system analysis and design can be executed in a following manner:

- Identifying the problems which can be analyzed by administrators or officials from the organization. In this case study, the sales manager who identified that the previous system was not user-friendly and did not function in some cases.
- Creating a hypothesis after the problem is identified which helps to recognize the factors that caused the problem.



- Collecting information: this step helps us to obtain the information about the problem and find a solution which can be implemented.

The developing and analysis team were well aware of the system flaws, and two type of users were identified. Salespersons, who are working with the system to showcase the brochure projects to a potential client and new hires were designated as the second type of users who start learning the product for the first time and need a supervisor to guide through the process. Therefore, a solution was suggested to redesign the system and make it more user-friendly.

## 11.2 Analyzing the business case

The business case involves controversy with the different perspectives of arguments and many facts to integrate. It was helpful for the development, therefore, to analyze and keep track of all data of arguments and counter arguments.

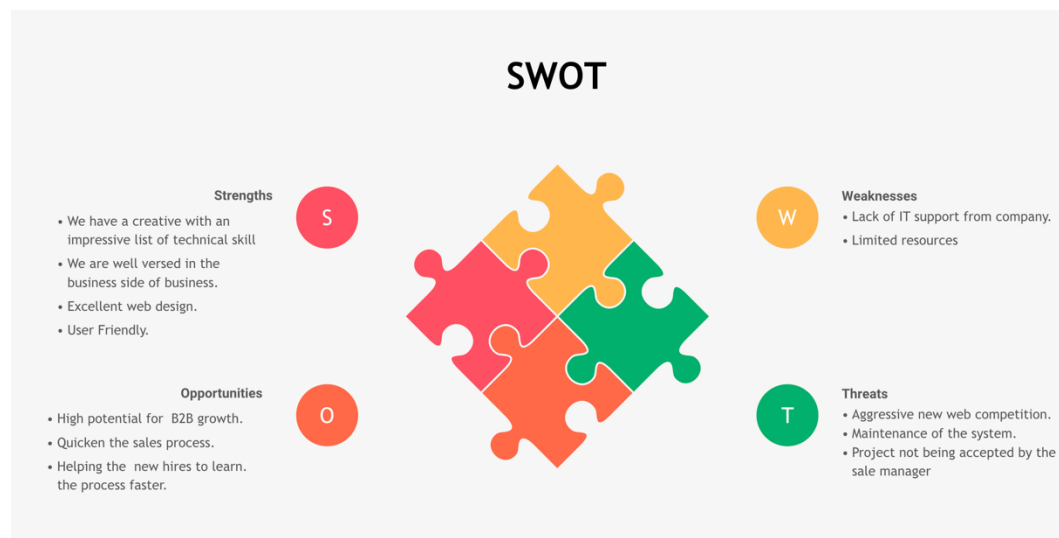


Figure 10: Swot analysis

During this phase, the proposal was presented to the company representative for review. This plan contained the reasons why JS Suomi should pursue the alternative and build a new system for their salespersons. Additionally, this analyze reflects the company's vision, mission and IT needs in their sales department. Therefore, it is essential to provide management review, such as SWOT analysis to present what the new system will offer to JS Suomi. SWOT analysis stands for Strengths, weaknesses, opportunities, threats (Pahl & Richter, 2009). Strengths describe why our design will help JS Suomi to achieve its goal. Weaknesses details what could hinder this project to perform at its highest level. In contrast, it helps the development to understand weaknesses and reduce them. Opportunities determine what are

the external factors which can help to benefit the project. Threats refer to the possible risks which potentially harm the organization and the project.

### 11.3 Requirements Modeling

Requirements modeling is the process of looking for the reasons for implementing and designing a new service, and if there is an existing service, flaws are looked for, and efforts are made to understand why the current service is not user-friendly. This process helps in understanding the client needs and prevents from developing a platform with usability flaws.

Usability flaws and user experience issues can contribute to the lack of engagement and in this case, causes spending more time on searching for the right content. Furthermore, more problems with existing systems were found, such as:

- In some cases, the service did not deliver the critical piece of information because employees were not able to access the system outside of the company. As a result, the salesperson cannot showcase the company's services to the client.
- Teaching new hires how to use the existing system was time-consuming due to the system not being user-friendly.
- The platform was not well organized, and this was the main reason for implementing new service where users could access the categories they want in a matter of seconds.

The requirements were to develop a platform that required less human intervention, delivering the service that user hope to achieve and also make it more user-friendly that would help both in time and efficiency.

The first version of the application, which was done by the sales manager of the company, was an excel file containing plain text and links. It was the company's request that this excel file could be turned into an application. The user would choose either to browse brochures according to NACE code from the left or by a theme of the brochures from the right.

	A	B	C	D	E	F	G	H	I	J	K	L
1	NACE						TEEMA / AIHEALUE					
2	16						<a href="#">Tuote-esite</a>					
3	24						<a href="#">Palveluesite</a>					
4	25						<a href="#">Profiili/Imagoesite</a>					
5	27						<a href="#">Referenssiesite</a>					
6	28						<a href="#">Ympäristövastuu</a>					
7	35						<a href="#">Rekryesite</a>					
8	38						<a href="#">Messuesite</a>					
9	41						<a href="#">Juhlavuosi</a>					
10	43.1						<a href="#">Opas</a>					
11	45.1						<a href="#">Kansainvälinen tiedotus - Vientiesite</a>					
12	46.3											
13	49											
14	68											
15	71											

Figure 11: First version of the application

In the next view, the Excel file displays some of the brochures depending on what the user clicked and containing information about the brochure. Also, the text would provide the link to the electronic brochure and when links are opened from an excel file the computer usually gives a warning about a link from untrusted source, which also was not user-friendly considering that inexperienced computer users might startle a warning sign. However, the excel file gave us more insight for understanding how to design the application and what were the requirements for the application.

	A	B	C	D
1	Alkuun	NACE	TEEMA & REFERENSSIT	
2			Tuote-esitteet	
3		28	<a href="#">FB Ketjutekniikka Oy</a>	Esitteessä tuotiin esiin uutta vihreää profiiliketju tuotetta sekä sen käyttökohteita/hyötyjä. (FI/E
4		28	<a href="#">Pomarkun Erikoistarvike Oy</a>	Tuotevalikoiman kattava esittely sekä uutuuksien esille tuonti. Kolme kieliversiota (FI/SWE/ENG
5		28	<a href="#">Nokka Oy</a>	Olemassa olevien tuoteryhmien esille tuonti, sekä uudesta Septem-puomistosta tiedottaminen.
6		28	<a href="#">Steel-Kamet Oy</a>	Kaikki tuoteryhmät yhdessä. Jakelu: Sijoittajat, betonitehtaiden omistajat, Suomessa, Ruotsissa,
7		46.3	<a href="#">RuokaHertta</a>	Menekin edistämiseksi ja tilaamisen helpottamiseksi kauppoille. Viivakoodit ja tuotekohtainen i
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Figure 12: Second view after selecting a category in the first version

## 11.4 System Modeling

System modeling can be explained to translate a physical system into a set of equations that reasonably and accurately represent the system. For instance, it helps developers and designers to understand the whole flow of the process from the point of opening the application to the point that the application is closed.

Correspondingly this phase supported to work on small details that helped to understand the user's perspective and the user's experience. Therefore, a concept called "Maslow's Hierarchy of Needs" has been used in this stage of design to understand the user's flow. This concept explains, "in the life of a human being some criteria are more important than others, In the event of that, the most fundamental elements must be achieved before it is a possible start to satisfy the higher-level needs of the users."

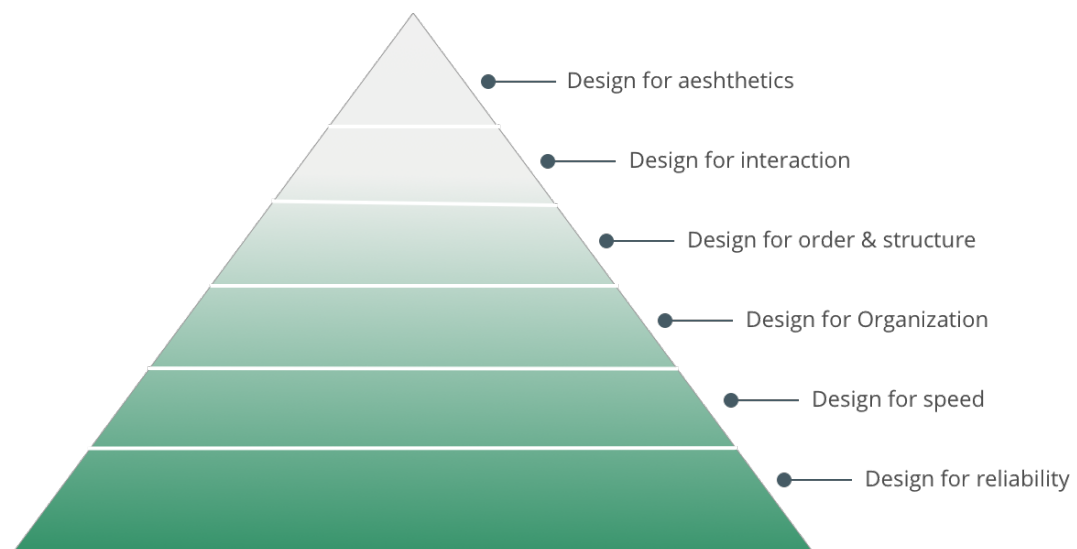


Figure 13: Maslow's Hierarchy of Needs

The most fundamental element that every user will expect from the application to be reliable follow the same principles and same elements as the CRM tool of the company. For this reason, reliability had to be addressed before it was possible to address higher levels and as developers, this proved to be the greatest challenge. It was necessary to develop a base and upper levels on top of it, whereas users from the moment of opening the application would look at its application from the top-down perspective which is the user interface. Therefore, to take next steps end user's flow needed to be prototyped.

During the prototyping process, different tools were used which each had their unique ways of functioning regarding understanding and implementing the design. Sketch for Mac was one of the tools which had been used in this project. Sketch is a lightweight professional design application which makes it the perfect package for advanced workflow. Accordingly, with this application, paper drawings were eliminated for the final version.

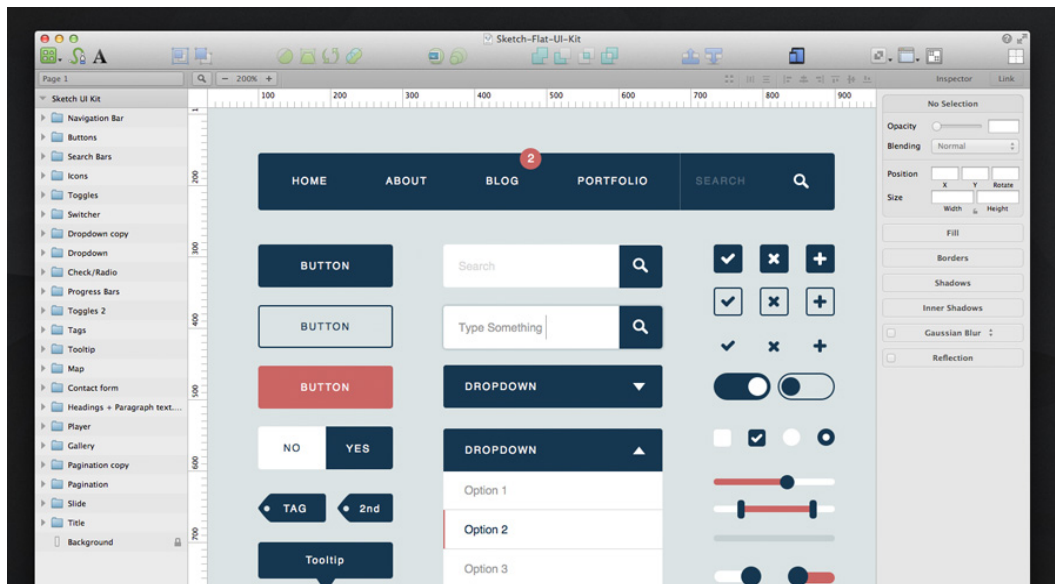


Figure 14: Sketch interface

To design a perfect flow in the application, decision points were created in which user was able to discontinue the process or return to the previous one. This required a landing page which acted as a home page which followed the categorizing each industry and creating subcategories for each. At this point, the focus was in keeping users on only one page so when they discontinue one flow, they will be able to continue with another flow right away. With these factors in mind, a flow for each call to actions had to be made. The call to actions at this point were categories and subcategories.

To demonstrate the flow, another rapid prototyping tool called Marvel App was used. Marvel is great prototyping tool to show simple static prototypes. This app helped to show flow between different CTA (Call-To- Action) and how the interactions work.

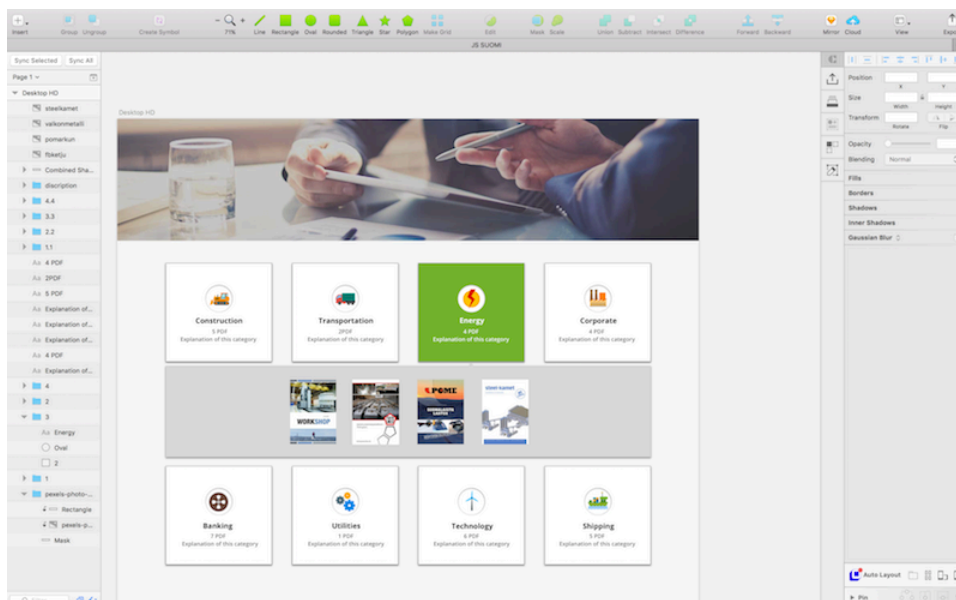


Figure 15: Sketch of UI design in Marvel

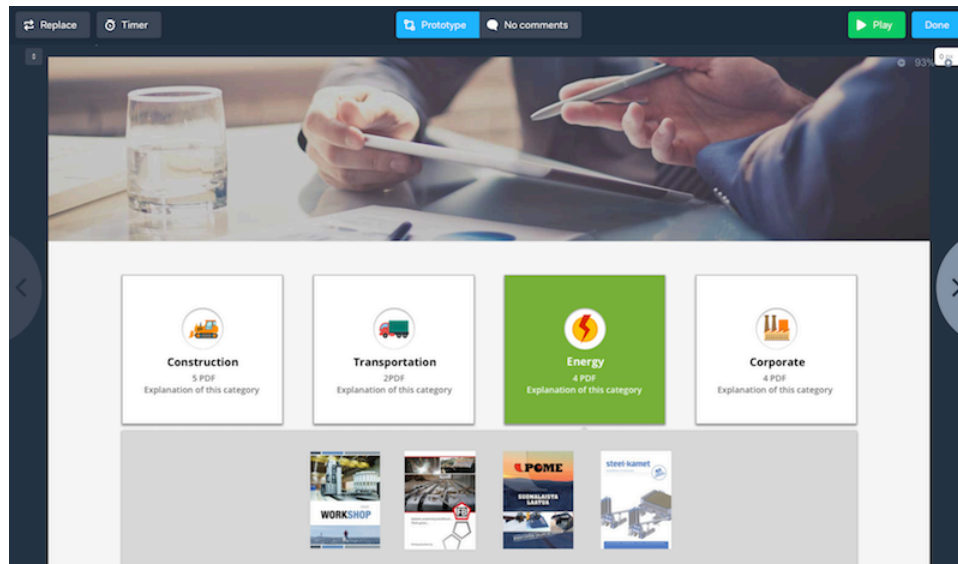


Figure 16: Sketch of UI design in Marvel

### 11.5 Beta testing

A common tendency in application development is first to build a beta version of the application which is often incorporated with usability testing. “The role of a beta test is to assess the quality and functionality of product through “real world” testing” (Fine, 2002). The beta version of the application was built with a very fast phase after agreeing to the requirements of the application with the case company. Making the beta version layout did not take more than few weeks but adding the content was more time-consuming. The beta version was released and introduced as an improved version of the excel file. The beta version was made in a manner which is not recommended in HTML coding by most coders. Since it was possible to build it fast and test the concept of the application with the sales people of JS Suomi, it proved to be a good idea instead of following the excel file with a designed fully working application. The beta version used `<tr>` and `<td>` table tags to display the brochures which do not look beautiful in the code. The final version has a nicer framework which is clear in code, easier to read and modify.

The beta version had JavaScript code to rotate `<div>` which were linked to a “data-link” variable.

```

54
55 <div class="dropdown" style="float:right;">
56   <button class="dropbtn">Teema</button>
57   <div class="dropdown-content" style="right:0;">
58     <a class="link" href="#about" data-link="profiiliesite">Profiiliesite</a>
59     <a class="link" href="#about" data-link="palveluesite">Palveluesite</a>
60     <a class="link" href="#about" data-link="tuote-esite">Tuote-esite</a>
61     <a class="link" href="#about" data-link="referenssiesite">Referenssiesite</a>
62     <a class="link" href="#about" data-link="ymparistovastuu">Ymparistovastuu</a>
63     <a class="link" href="#about" data-link="messuesite">Messuesite</a>
64     <a class="link" href="#about" data-link="juhluvuosi">Juhlavuosi</a>
65     <a class="link" href="#about" data-link="opas">Opas</a>
66     <a class="link" href="#about" data-link="vientiesite">Vientiesite</a>
67   </div>
68 </div>
69
70
71
72 <!-- listing the references according to nace-->
73
74 <div class="textContainer_about">
75
76 <div class="textWord_about" data-link="24">
77 <table>

```

Figure 17: Dropdown of themes in the beta version

Following script was used to rotate the different themes and NACE categories. The data-link variable is rotating the selected theme or NACE category to display the wanted <div> which contains the selected category of brochures. The other brochures maintain in the background invisible to the user.

```

765
766
767
768
769
770 <!-- script for rotating all brochures-->
771
772
773 <script type="text/javascript">
774   $('textWord_about').hide();
775
776   $('link').click(function() {
777     $('textWord_about').hide();
778     $('textWord_about[data-link=' + $(this).data('link') + '']).fadeIn({
779       ...
780     }, 0);
781   });
782 </script>
783
784

```

Figure 18: JavaScript for rotating data-link variables and display selected category

In the interface of the beta version a user can choose the brochure type according to NACE code on the left side and according to themes on the right. The brochures would then align to the center of the application with a description about each of them.



Figure 19: Interface of the beta version

Fast implementation of the beta version suited well for testing, modeling the final requirements of the application and receiving user feedback to understand better how the final application should be designed.

## 11.6 User Interface

User Interface is a process of understanding how a user interacts with the digital contents provided. UI (User Interface) is a subset of UX (User Experience). UI works as a skin for UX and helps to give UX flow more visual context, and helps end-users to understand the flow of the application.

To achieve an excellent UI, powerful tools were needed for designing and which were familiar for the development team, such as Sketch, Illustrator, and Tumult Hype 3. By using mockups and previously created UX flows in Sketch, it was possible to start replacing each section with symbols and graphics. The first point to remember in this phase was to follow the company's brand book, for instance, it gave us information about colors, fonts, and logos which should be used.



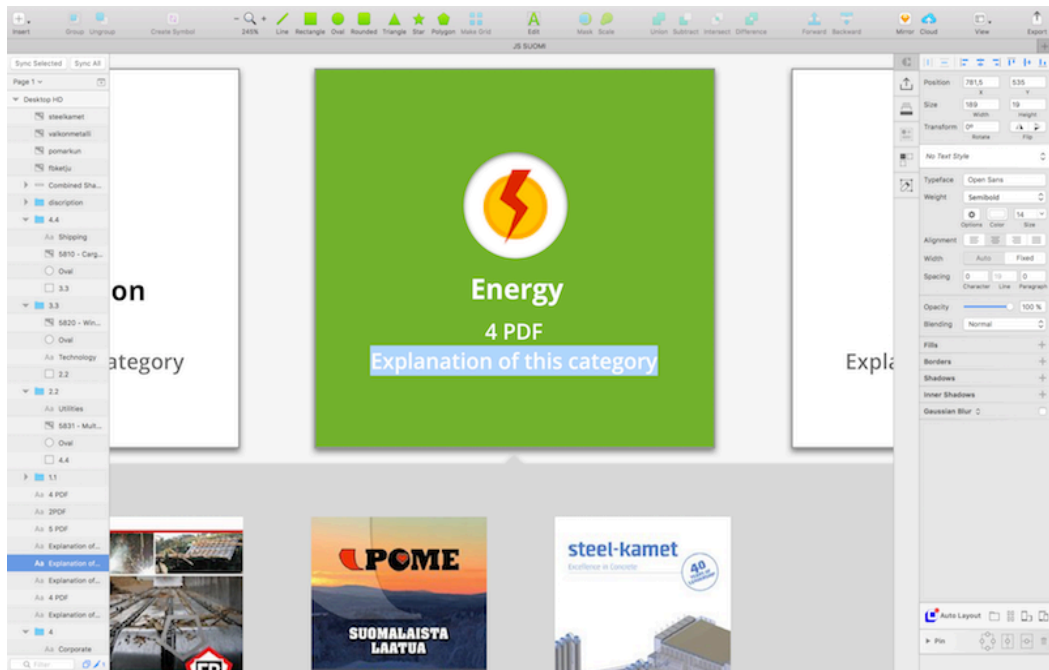


Figure 20: Sketch of UI design 1

Further, in designing phase, different icons were used for each category so that for a salesperson the application would be easier to navigate through without reading the description of each category. Adobe Illustrator was used for designing each icon used. Adobe Illustrator is vector-based drawing in an illustration program. The main reason Illustrator was used, was to create vector images so that the company could resize them for future projects.

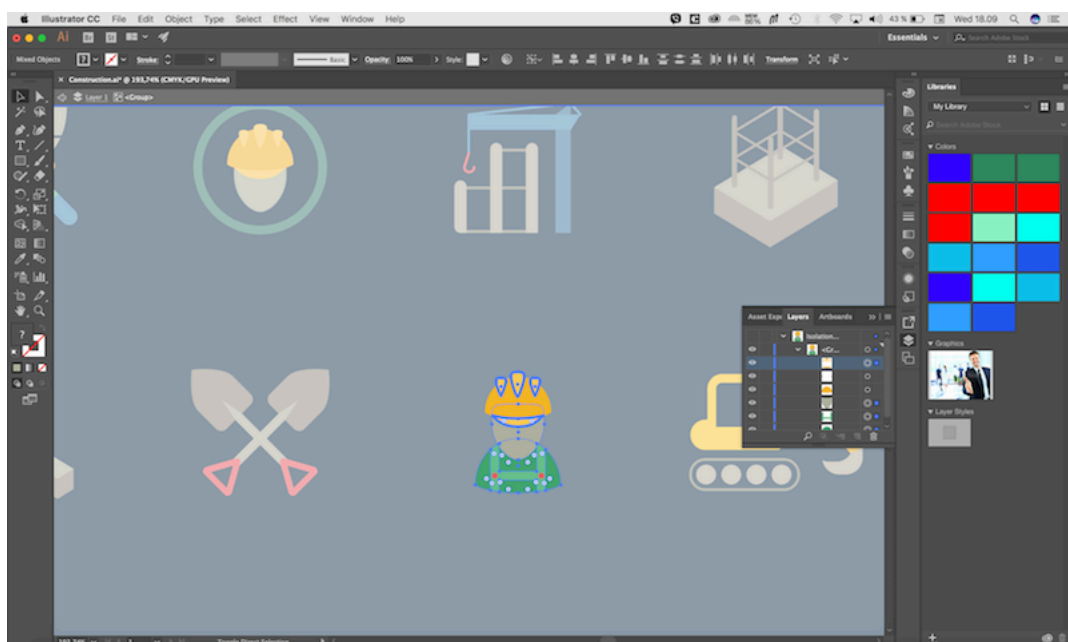


Figure 21: Illustrator: Used to design icons

After designing graphics, the application design was decided to be tested by creating a simple HTML5 version. An application called Tumult Hype 3 was used which enables users to drag and drop their designs to create an HTML5 content from the graphic. Hype provides many useful features such as guidelines, alignment, and resizing tools for arranging content. Applications such as Hype 3 helps developers in many ways in testing before development phase.

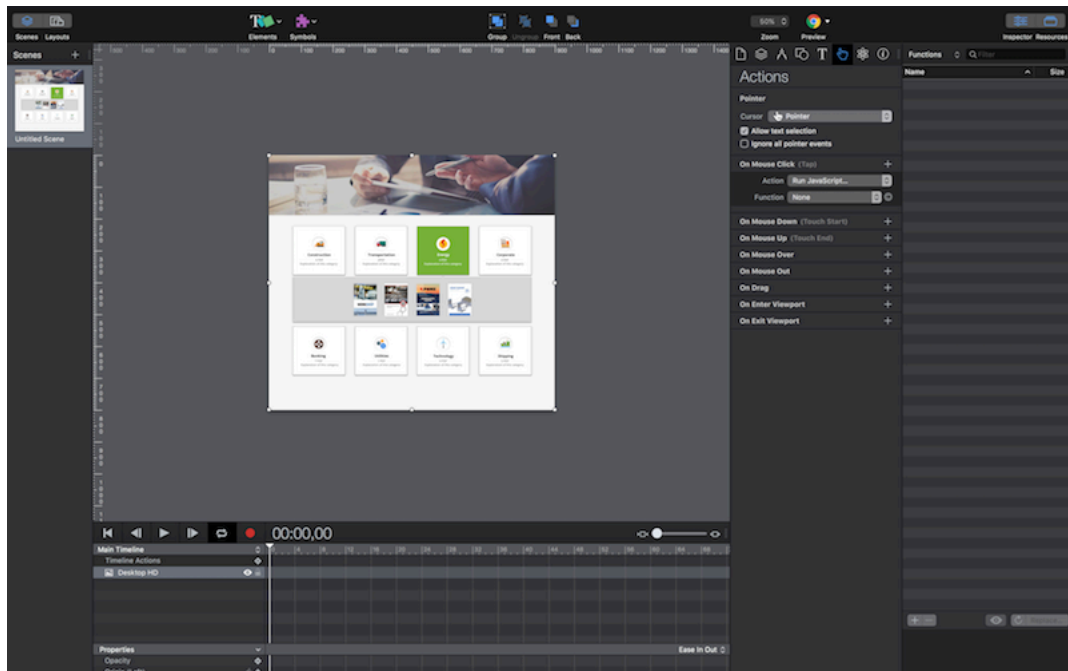


Figure 22: Tumult Hype 3: Used for Prototyping

## 12 Implementation

The implementation phase is a process where developers start developing the application base on the two previous steps. This move is imperative because the team members need coherence during development and excellent communication to ensure the project is consistent with the starting point.

### 12.1 Development team

The development team consists of two members, Tuomas Riisalo as a front-end developer and content writer, and Navid Haddad Nosrati as a front-end developer and UX/UI designer. Roles have been decided base on experiences and abilities of each member. Each members' skills are applicable the project and cover every aspect of the process.

Tuomas has been working as a project consultant in JS Suomi for four years, and his experience regarding sales activities helped us to get the right contents for the development

step. Similarly, his skills in IT field has been proven and played a role in front-end developing, gave the team an advantage.

Navid has been working as Head of UX/UI design in a company, and he has more than five years' experience in the design field. His expertise in the field helped in designing phase to understand the user's flow when using the application and support it with a stylish graphical interface.

### 12.1.1 Communication

Telecommunication played the main role in communication between the members. Communication is not just the transmission of information but also imparting of understanding. Effective communication must provide information which must also be received and understood. With this in mind members preferred to used well know platforms such as Slack, Dropbox, Google Drive and WhatsApp.

Slack is a powerful platform which allows users to bring together all the people whom a team needs to communicate Moreover, flow all communication into one space. Slack mainly used to segment each phase for that reason team members could navigate through each step conversation. Slack also enable users to follow their conversation on different devices.

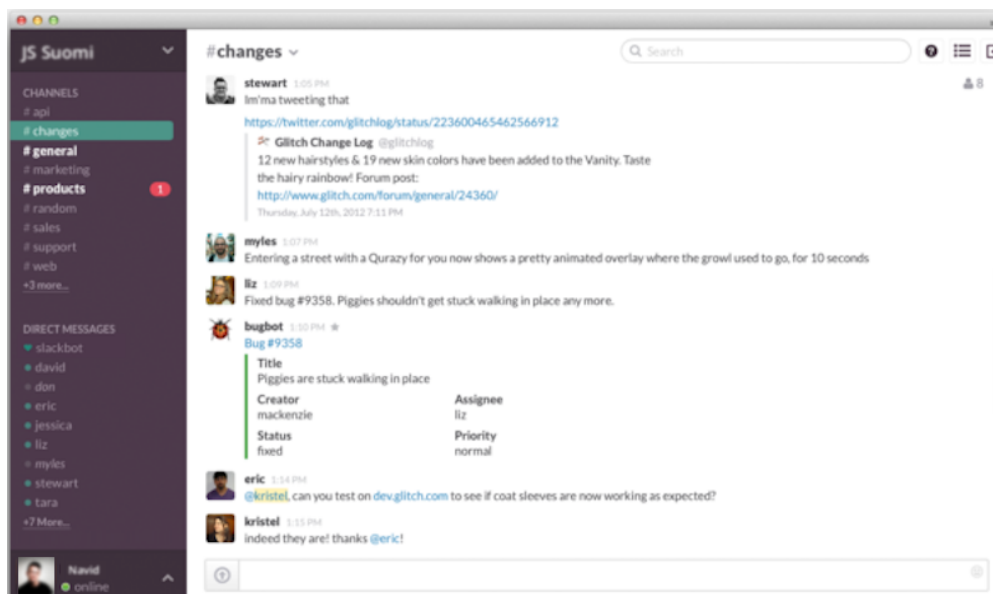


Figure 23: Slack interface. Used Mainly for Communication

### 12.1.2 Progress Monitoring

Progress monitoring is a process of tracking, reviewing and reporting the progress to meet the performance objectives defined in the project management plan. For this reason, Microsoft Project was chosen as the main tool for monitoring the progress.

Microsoft Project (MP) is a project management tool that offers powerful control and monitoring capabilities at all stages of project development and fulfillment.

Accordingly, MP helped the development team to:

- To determine each member level of performance
- To make instructional decisions based on data
- To write appropriate annual goals and objectives

### 12.1.3 Risk Management

Risk management is a critical activity, and it includes identification, prioritization, and treatment of risks face during the development phase.

Risks arise from over idea of perspectives such as project failure. To minimize the failure in developing steps each section is classified in coding and labeled. For instance, starting point for each class and div in the code " <! --NAVIGATION START-->" <! --NAVIGATION END--> ".

The project did not have an aggressive deadline, but the risk of missing a category was high, so to eliminate the risk, frequent communication with the client was maintained and double-checking of the contents. If there was any be changes in contents, communicating with the client ensured importing of the right content happened.

Knowledge of coding languages was an obstacle in developing phase. Both members did not have enough experiences to cover all the aspects of application build. To overcome this obstacle, a senior software developer was consulted about some parts in the development phase. The developers experience helped to reduce stepping stones on some parts and minimize complexity.

## 12.2 Technologies

To complete the development phase, many web technologies were implemented to the UI design. For instance, standard web languages such as HTML5, CSS3, and JavaScript; Google web fonts for texts. Also, this project was based on Twitter bootstrap.

### 12.2.1 HTML5

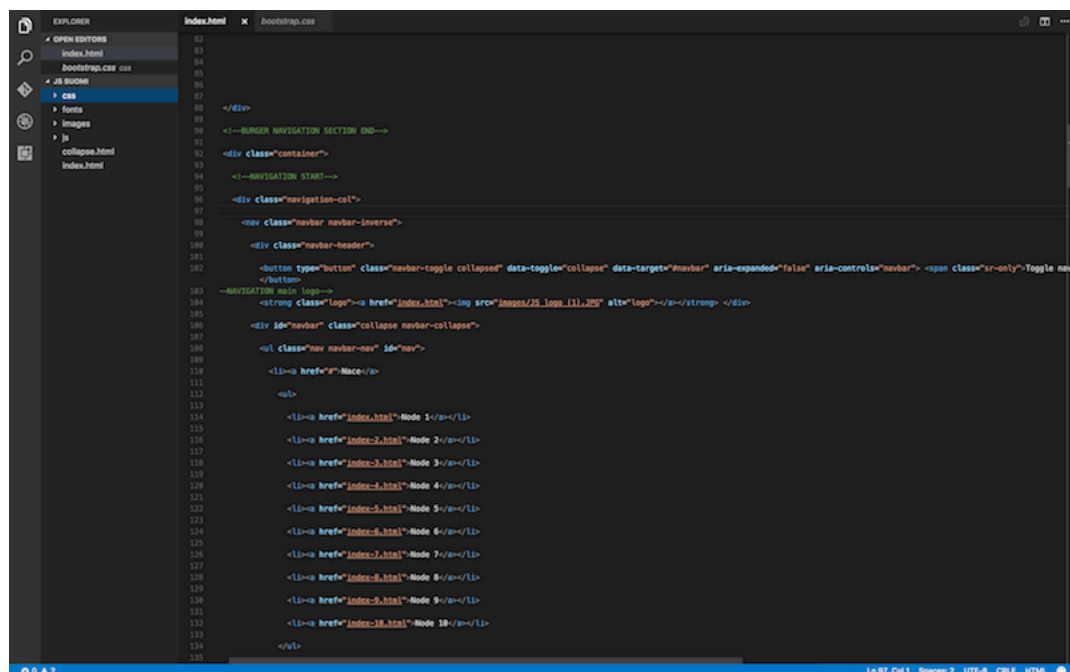
The actual term HTML stands for "Hypertext Markup Language, " and the keyword is Markup. Moreover, HTML is the type of markup language. Markup is extra information that can be

added to the content, to data or other kinds of information to give instructions on how it should be presented or how it should be otherwise used.

The HTML document is just a text file that has the file extension either .HTML or .HTM and can be viewed in any browser in kind of the same way that it is possible to view a word document in Microsoft Word for example.

Since the original HTML was invented with the web over 20 years ago, it has gone through many updates but it been more than a decade since the last update. Therefore, HTML has been a few steps behind changes on the web for quite some time. For instance, when the video came along for using in web developers could not integrate it naturally into HTML, for that reason companies developed their video players, and developers used them as a plug-in which it was risky. HTML5 is adding capabilities so developers could integrate for instance a video inside their code. Example "`<video> <source src="NO_PLUGINS_REQUIRED.mp4" type="video/mp4"> </video>`".

HTML 5 is not only limited to videos, and it allows developers to more to code which previously was hard or even impossible to do such as audio, vector graphics & animation, drag and drop, editable web page content, storage within the browser and so on (West & Matt, 2012; Wrike Team, 2017; Young, Dive Into Twitter Bootstrap, 2016).



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technology, developers and designer had to make their designs in Photoshop and cut them into pieces, and each one of those pieces had to be put in a table cell and often because graphics used as heading they did not have text that would be readable by search engines.

CSS helps developers to place all their styling codes into a self-contained document called Style Sheet. The Style sheet is separate from HTML, which means a new style sheet can be applied to the same HTML file and have an entirely different style for a website or application.

CSS3 is simply a brand much like HTML5 is, and developers are using it as a term to describe the new CSS features and functionality that have emerged over the last few years. Equally part of this function is the continued development of CSS through the W3C. Moreover, another part of CSS3 is being driven by a new generation of browsers that focused on giving designers most potent tools for creating sites or applications.

Examples: Text shadow property, creating multiple columns and working with web fonts.

### 12.2.3 JavaScript

JavaScript is a programming language which can be run locally in a browser. The web browser whether that is Internet Explorer, Safari, Firefox, Opera or Chrome they all content JavaScript engine. The operating system or in this case computer runs the web browser, the browser contains a page, and the page contents the JavaScript. Furthermore, JavaScript can also run on a server using Node JS.

JavaScript is limited in a way that it does not have access to the file system of the operating system that it is running on. For that reason, there are no words in JavaScript to open or save files locally because of security reasons.

"JavaScript (JS) is one of the three core technologies used to produce content on the Worldwide Web" and the other two being HTML and CSS" (McPeak & Wilton, 2010).

### 12.2.4 Google web font

During developing an application or website, fonts need specifying in HTML and CSS files. The fonts that users have installed on their devices should be considered. For instance, having hundreds of fonts while developing, end-users of an application might not have the same on their operating systems. Also, what needs to be considered is that there are differences in windows and mac or older and newer operating systems. For previous reasons, developers are using fonts which are available on the web. Google fonts are not dependent on the user's computer.

### 12.2.5 Bootstrap

Bootstrap is a framework developed by Mark Odo and Jacob Thornton at Twitter. It gives all the tools a developer needs to build websites, web applications, or simple prototypes. Bootstrap also comes with a variety of JavaScript powered controls, for example, modal windows, drop-down menus, tabs, and even a carousel control which are styled in advance.

Bootstrap provides styles for almost any web element such as like buttons, form, and tables. Moreover, it comes with icon fonts, and it can easily be added to a web page or web application. Icons are scalable and can be modified in any way. The framework also provides an excellent 12 columns responsive grid which adapts itself to a variety of viewport sizes, from large desktops to phones. "Bootstrap, quite simply puts the power of design and UI layout back in the developer's hands, leaving things in a nice, clean, easy-to-maintain state that can then be passed on to a front-end graphic designer whose job it is to make things shine" (Young, 2016).

## 12.3 Development tools

Many developing tools, programs and services had been used during the development, and in this section, they will be described. Visual Studio Code 2 used as preferred text editor for the reason that both developers can access this text editor on Windows and Mac and Git has been used for offsite backup.

### 12.3.1 Visual Studio Code 2

"Visual Studio Code (VSCode) provides developers with a new choice and tooling, one that combines the simplicity and streamlines the experience of code editor with the best of what developers need for the core code edit-debug cycle. It is the first code editor and the first cross-platform development tool in visual studio family, running natively on Windows, OS X, and Linux." (Visual Studio Code, ei pvm).

VSCode features a powerful and fast code editor ideal for day-to-day use including code navigation, customizable key bindings, syntax highlighting, bracket matching, audio indentation snippets and built-in support for dozens of languages.

"Developers often need to work with code as more than just text, VSCode support for always-on IntelliSense code completion, rich semantic code understanding navigation and code refactoring. The code includes a rich support for asp.net 5 developments with C # and no development with typescript and JavaScript, powered by the same underlying technologies that drive VSCode." (Visual Studio Code, ei pvm).

Code integrates with existing tools and can invoke, run tests and execute just about any command line script from within the tool. Errors and warning are visible and make the workflow very easy and faster. (Visual Studio Code, ei pvm).

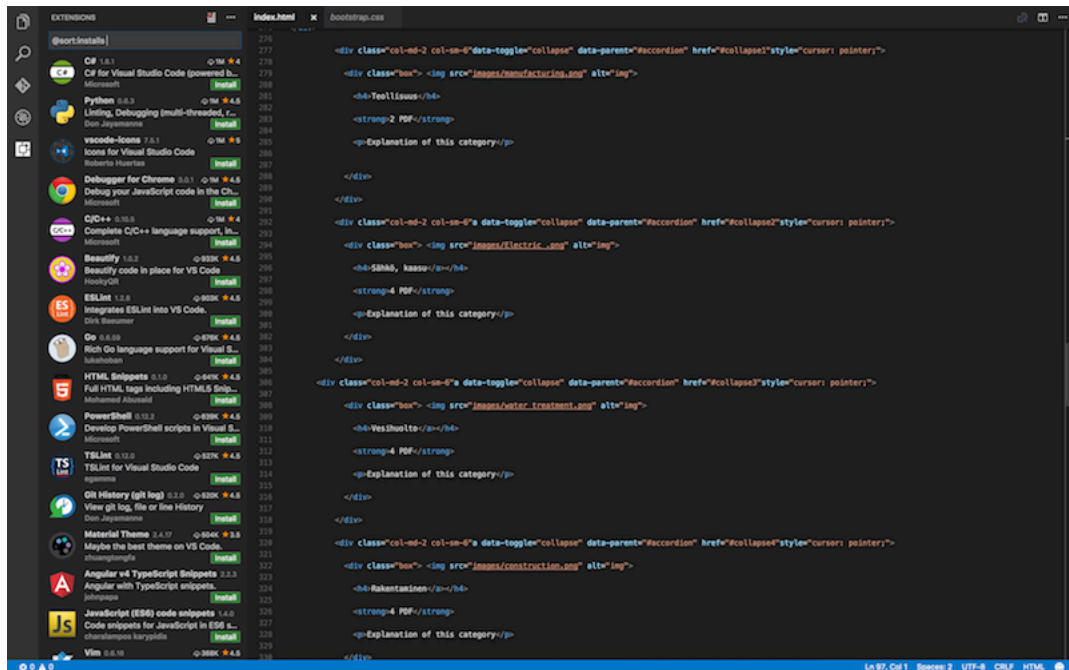


Figure 25: Visual Studio Code

### 12.3.2 Git

Git is a version control system for tracking changes in computer files. It was created in 2005 by Linus Torvalds who was also the creator of Linux. There is no specific language or framework needed and can be used for static HTML websites.

Version control system always keeps the older versions of the project and can be restored to that specific version. Furthermore, the purpose of using Git is collaboration. Git provides to developers with a shared workspace, and it continuously notifies who has made what kind of change or what has been modified. For that reason, the project will always evolve as a whole from the start, and it will save much time due to there would not be many conflicts.

Storing versions can be very crucial for developers as saving versions of a project after making changes is very essential. Therefore, Git allows developers to create their safe points (commits) during the project. Commits allow developers to revert to the point that every function in the project works correctly.

in Git branches connect the commits together and initially, when a Git repository has been created Git initializes a branch which is called master, and as long as developers create commits, they continue to grow their master branch.

“A feature branch is a term that can be used when a developer wants to implement the feature without changing the flow of the main development branch. As a result, one



developer can work on a feature branch and another developer can continue to modify the main project. When the feature branch is ready and working, it can be merged back into the development branch and create a new safe point” (Leoliger & McCullough, 2012).



Figure 26: Git branch

#### 12.4 Directory structure

For a website to function correctly, developers need to set up an appropriate folder and file structure. Data management helps to have a rhyme or reason to store various items that are

going to be part of the project. Therefore, having a good structure from the beginning of the project gives the advantage of minimizing risks and failures during the development.

There are several commonly used file structures for developing a web application. The very first step is to have Parent (Root) folder. This folder can be name based on the project or in this case using client's company name as the folder name.

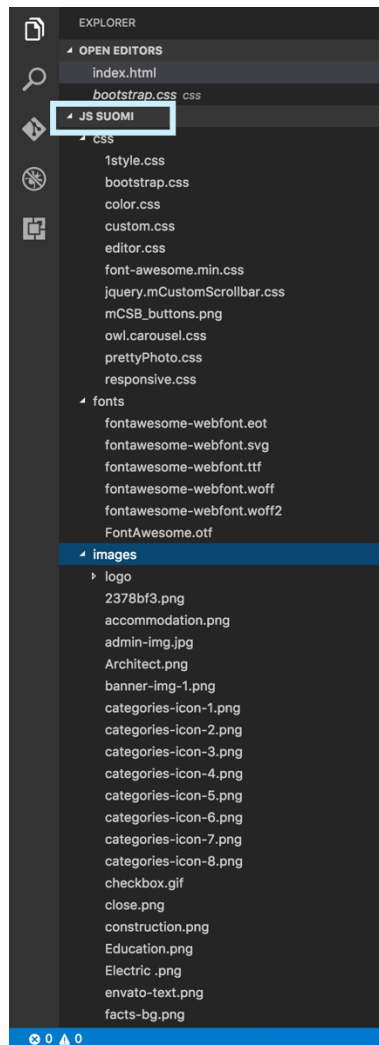


Figure 27: Root folder

After proceeding with creating the root folder, the developer needs to think about the components of the project. For instance, the folders that contain all the files of the project, including the HTML files, CSS folder, images folder, and JavaScript folder. Having an organized structure during a project helps to follow the workflow. Moreover, creating a file structure for the CSS folder proved useful. This way each CSS file has a clear separate task for the application. For instance, a CSS file was implemented only to contain the primary color of the application which was based on company's brand book.

Having a modularized approach applied in the coding process, each section was labeled, and the starting point to ending point indicated. Modularized approach helps in maintainability, as

it makes it easier for a developer to locate the part of the application that requires attention at the time.

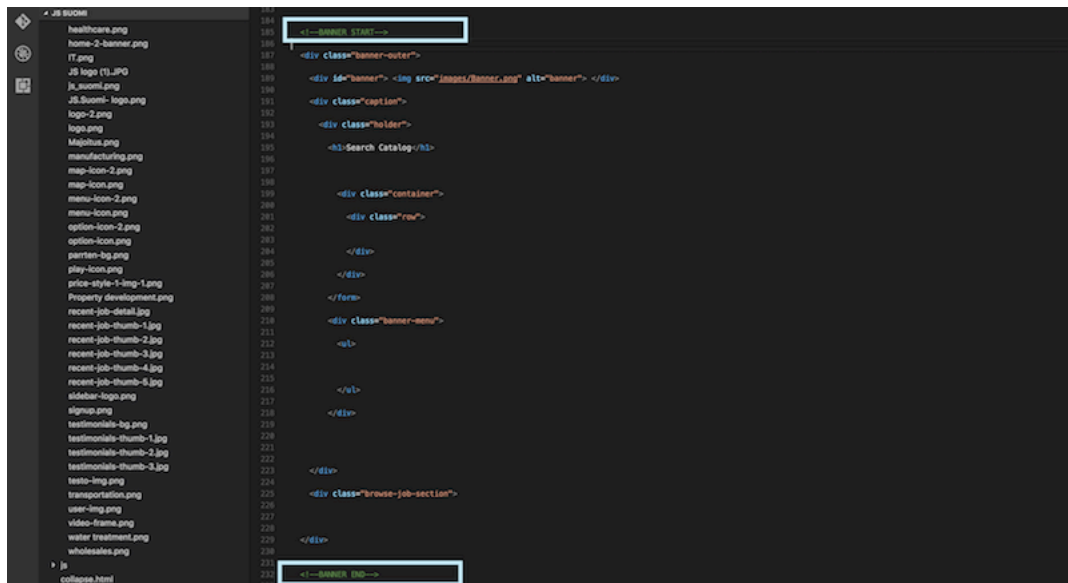


Figure 28: Modularized approach

### 13 Storing the application

The application is stored on the local drive of the company, which can also be accessed remotely with the company computers. Therefore, it doesn't require external hosting over the internet or a database for files. The simple file system on the local drive is sufficient. It is useful to build a web-based application since, if it were needed to be uploaded to a different server, it would be relatively easy because of the scalability of web applications.

The deployment took place in a folder which the sales department is using for storing files employed in training.

The first test with the application was done outside the office, and when the beta version of the application was ready, it was added to the training folder.

### 13.1 Maintenance and managing the application

The local drive contains two copies of the application. One that is being modified is located on the developer's folder on the same drive as the application is. The application is never modified directly. The application in developers' folder is changed, and then the application in the destination folder is only replaced with an updated version. This ensures that a backup is always present and two replicas of the application exist. The developer also stores one back-up on his personal computer in case the company shared drive should fail. Also, the application is never accessed by the users from the source but a quick link so the location folder is not accessible by unauthorized personnel. "Back up everything! If you know exactly where the application software has been loaded you should be able to copy it to a safe location. If the update goes badly then you'll restore the original files and subdirectories using the copied version" (Bourne, 2013).

During beta version, a user accidentally navigated to the folders, where the application files reside while trying to open the application and later complained how he could not open it. It had been obviously too easy to access the location folder by accident. That was a good learning point how people could make mistakes even when there are warning signs and simple instructions not to do or open something. Despite all the meetings where instructing happened where to click to open the application, it seemed to have failed. Therefore, the physical application and its files were decided to be stored to the developers' folder where other users do not have writing rights but only can read the folder. This ensures that no one is able to accidentally delete or alter any of the files. The workers only have a quick link to the application in a folder which is used to store training materials. "Minimizing access control for users is part of mitigating risks which is part of the best practices in application development" (Harwood, 2016).

Some workers still had difficulties finding the application and accessing it again when in need. Therefore, some of the workers were helped to add the reference database to their favorites in Chrome or Internet Explorer browsers. This seemed logical since now they had a quick link to the application which reduced, even more, the possibility of someone accidentally damaging it.

## 14 Testing

### 14.1 Development testing

In development testing, the application was tested on different platforms with Chrome developer's tool. It was concluded that the application does not need to scale for a mobile platform but for tablets and computers screen would suffice. Therefore, the testing did not involve the mobile aspect. The case company also complied with these requirements since the sales representatives have tablets and computers generally with them when meeting customers. Testing was necessary to execute with Internet Explorer and Chrome. The Office of the case company is allowed only to use before mentioned browsers. Most workers use Google Chrome; hence it was mostly used in development testing. The use of internet explorer is according to statistical evidence in great decline since the past couple of years. Therefore, was decided that the application would still have minimum working requirements for Internet Explorer, but it would be optimized mainly for Google Chrome browser.

Later on, testing mostly revolved around fixing small errors such as a misplaced link other mundane mistakes which occur occasionally.

### 14.2 User testing

User testing was performed before the release of the application. During user testing suggestions for improvement came up. Also, sales people who were testing the application suggested some brochures be added to the application which for some reason had not been taken into account. The implementation could be called successful since no unknown bugs or mistakes in the application were found during user testing or after the release of the final version.

### 14.3 User feedback

The sales department of JS Suomi is giving feedback every Friday about the application in a weekly meeting. This meeting is partly focused on discussing how the application could be of use or which reference brochures should be added to the application. The reference brochures need to have sufficient information from the customer how it was used and what benefits it brought to the client. Therefore, the database does not necessarily have the very latest references unless for a particular reason. The user interface has been praised for being professional.

With the users was agreed to report when a customer project included something special, for example, a new client segment was opened, a new theme invented or the product implementation brought significant benefits for the customer. Then this customer case would be added to the application with appropriate information about the project. The goal is that a similar successful project could be repeated by other sales people as well.

## 15 Conclusion

Overall the application was a decent addition to all other sales tools of JS Suomi personnel, and it is maintained once in a while to store information about interesting customer implementations and to emphasize the benefits the brochure brought for those customers. The Importance of references and the right way to use them in sales cannot be highlighted enough.

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