LunchHero - a student’s everyday hero

- A case study in how to construct a web application with high usability regarding navigability and ease of purchase

LunchHero – en hjälte i studentens vardag
- En fallstudie i framtagningen av en webbapplikation med hög användbarhet inom navigation och enkel köpprocess

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Abstract

At present, there are food trucks at the Linköping University campus offering lunch meals in a traditional way, without using any complementary web applications. However, a market study conducted during the pre-study shows that customers desire additional services from the food trucks and would increase their purchasing frequency if some of these features were to be implemented. For instance, the lack of online pre-ordering is a causal factor to the issue that customers spend a lot of time in line waiting for their turn to order food. This study aims to find ways to implement some of these services into a web application, by focusing on high usability, with regards to good navigability and an easy purchasing process. The application was developed on a sprint basis and at the end of each sprint the application was subjected to user testing. The tests consisted of a System Usability Scale, a modified version of Bailey et al.’s First Click Analysis as well as a quantity of click test in accordance with Chapman’s theories. A high System Usability Scale score in addition to a successful First Click Analysis indicates that the applied methodology has resulted in a web application that satisfies the goals of having high usability and navigability as well as an easy purchasing process.
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1. Introduction

In this chapter the motivation for developing the web application is presented as well as the aim and the research questions. The last part of the chapter states the delimitations that have been made.

1.1 Motivation

At Linköping University there are food trucks located on the campus offering their lunch services. Long queues and not being able to see menus or which food trucks that are available for a specific day ahead of time are some concerns that students see as obstacles when ordering lunch at the food trucks. This is according to an introductory market study that was conducted.

The market study found that 54% of the asked questionnaire subjects would buy lunch more often at the food trucks if they could see which food trucks that are available ahead of time, on any given day. 43% of the participants that were asked responded that they wanted to see menus prior to their purchase and thus ordering more frequently because of that. A web application with good navigability provides information in an understandable manner. Furthermore, 57% reported that shorter queue time would increase their purchasing frequency. In contrast, 23% stated that they would buy more often if they were able to purchase the food through a web application online, see Appendix A. To ensure that the web application serves the purpose of a quicker, simpler solution than the present physical queue it is important to implement an easy purchasing process. The web application has been developed with these issues in consideration.

The lack of competitors at Linköping University creates a large gap to be filled, considering the need and desires of the target consumers which consists of students. The main obstacle to overcome would be the resistance to change the habits of both the consumers and the vendors. To deal with this concern, the development of the web application has been focusing on good navigability and ease of use when it comes to the purchasing process. By doing so an easy to use web application is constructed for its intended users through its focus on high usability. An easy to use application aids the consumer to overcome the initial resistant to change and provides a useful application for the students. Several key aspects that impact the usability are further described in the theory chapter. By narrowing down the scope of the research of these focus areas the research questions have been appropriately formulated. How these two areas, navigability and ease of the purchasing process, were tested are described in the method chapter. Some of the areas that were taken into consideration when constructing the web application were navigability by providing information in appropriate ways according to Kalbach’s definitions [1] and simplicity, as well as the consistency of the design [2]. The ease of the purchasing process was evaluated by Chapman’s and Bailey’s et al. ideas of
simplifying the checkout [3], [4]. It is interesting to evaluate these factors to construct a useful web application that can potentially meet the market's needs.

1.2 Aim

This study aims to research how to construct a web application with high usability regarding navigability as well as ease of the purchasing process, where users can pre-order food from a food truck online and later pick up the order at the desired time.

1.3 Research question

How can a web application for ordering food be constructed with high usability, regarding good navigability and an easy purchasing process?

1.4 Delimitations

To narrow down the scope of the development of the web application, some delimitations have been made, considering the broad area that developing a web application imply. Firstly, due to the project’s time aspects and set length, only the navigability of the web application and ease of purchase is studied. This is studied from the consumer perspective meaning the one's ordering food.

Usability is a broad term including many areas and factors. This study will focus on usability with regards to navigability and ease of purchase. Delimitations have also been made when it comes to the purchasing process. The focus within this topic is mainly on how the payment process as well as usability factors impact the ease of purchase, whilst ignoring topics such as abandonments during checkouts or factors that contribute to increased sales.

As for the study of the application's navigability, it is focused on navigability related to usability, ignoring the connection to user experience. Moreover, security issues related to navigability has been omitted. While possibly being an interesting topic to study, it is outside the scope of this report.

Regarding the testing of the application, there are a multitude of standardized tests that can be applied to answer the research question. However, the evaluation and measuring of the aforementioned factors has been limited to user testing, more specifically, to quantitative testing. Furthermore, since the focus of the study is on usability, areas such as volume of traffic to the web application, or the commercial success of the web application is disregarded.
2 Theory

In this chapter relevant work and theories for the project will be presented. The process of buying food for lunch from a food truck needs to be easy and navigable to assure high usability. Initially, theories and facts about e-commerce are brought up to set the web application in a broader context. The research then presents deeper insight about theories concerning the thesis research questions usability, navigation and purchasing ease. The chapter ends with a short section about development and user testing.

2.1 E-commerce in the food industry

“E-commerce is the process of conducting business online through sales transactions and information exchange” according to Wienclaw [5]. Wienclaw also states that for an e-commerce to be effective it needs to be a web application that is well designed, attractive and user-friendly. 60% of the population in Sweden have used an e-commerce in the first quarter of 2016. This is an increase by six percent since 2015 [6].

In Sweden during 2017, 15% of people between 16 and 85 years old have bought or ordered food or groceries online. For students, which is the main demographic of the study, the percentage is 17% and for people with a tertiary education, the percentage is 26% [7]. It can be considered that food enterprises converting to e-commerce is becoming a general trend according to Zhang [8]. Characteristic for food enterprises are their need of a rapid purchasing process for their clients since purchases are done often and in small quantities, and the transaction amounts are relatively small. The advantage of this conversion from manual transactions are that e-commerce leads to reduced costs as the management costs are lower when part of the purchasing process is done without interaction with a sales representative. Furthermore, Zhang states that the seller gets more control over the selling and can adjust the inventory level due to future demand as well as the range of products and food introduction easily can be used as advertising and marketing with the spread of internet. The convenience for the consumers also increase when it is possible to compare and even use Internet searching tools to find food of interest according to Zhang [8].

2.2 Behavior of a Customer

To avoid a customer rejecting the web application it is vital to maintain an attractive and efficient website as well as purchasing process. This can be done by lowering perceived customer irritation. The three major factors which raise the customer's perceived irritation are poor visual, navigation and information design [9]. For example, letting a customer add items that are out of stock to the shopping cart leads to confusion and irritation [10]. Better navigation leads to a higher usability and an easier purchasing process.
Online shopping consumers' behavior can be examined from both a utilitarian and hedonic point of view. The utilitarian aspects of online shopping are reflected by perceived usefulness and perceived ease of use. Convenience, lower price, information availability, and range of products when shopping are important aspects for utilitarian motivation. The hedonic aspects of online shopping are reflected by perceived enjoyment. Adventure, authority and status are important aspects for hedonic motivation [11].

- **Hedonist**
  - Experiential shopping behavior
  - Seek fun, arousal, escapism, adventure etc.
  - Want to immerse themselves in the shopping experience
  - More attracted to well-designed online shopping sites that are easy to navigate and visually appealing

- **Utilitarian**
  - Goal-oriented
  - Rational necessity related to goal
  - Look for efficiency and rationality rather than entertainment
  - Expects purchase with the least amount of irritation

Research by Habibollah et al. shows that mainly utilitarian orientations such as convenience, price and wider selection have an impact on the user’s attitude towards online shopping [12]. Habibollah et al. therefore suggests that e-retailers should emphasize user friendliness and a simple and inexpensive shopping process to ensure that the customers maintain a positive attitude towards the e-shop. Findings by Peck et al., P.-L. To and E.-P. Sung suggests that hedonic orientations like enjoyment and self-gratification plays as big a part as utilitarian orientations when it comes to motivating consumers to shop online [13], [14]. In the following chapters user friendliness and simple purchasing processes will be defined and explored.

### 2.3 Usability

Usability is a technical term that serves as a goal for product design. To achieve usability the user must be the center of the design to ensure that the characteristics of usability are incorporated in the design [15]. According to the International Standards Organization (ISO) in 1998, the term usability is defined as “The extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use.” [16]. This means that the user can produce the intended result, without any waste of effort and fulfill its need. Y. Lee and K. A. Kozar deconstructs the term usability into ten usability factors by comparing earlier studies and reports on usability [17]. The ten factors are consistency, navigability, supportability, learnability, simplicity, interactivity, readability, content relevance, credibility and telepresence. Consistency is about a consistent design throughout the application. Navigability is the number of alternatives for navigation and interaction that is provided. Supportability is the additional tools and
information on the application that helps the user to get a better experience. Learnability is how easy it is to learn how to perform the most important tasks on the application. Simplicity defines if the minimum amount of content and functions necessary are presented on the website. Interactivity is the ability to create interaction between the user and the website. Readability is how well the content of the website is organized and that it is understandable. Content relevance is how relevant the content of the website is. Credibility is how secure and reliable the website is perceived. Telepresence defines the feeling of presence that can be felt in a virtual environment created by a computer by the user. One of these factors, as previously mentioned, is navigability and it is especially interesting and important for e-commerce as it is strongly connected to the time to perform tasks on a website [9]. In the sections below the term navigability in regard to usability will be specified.

2.3.1 Navigability

Web navigation is the act of moving across a webpage and plays a major part in how the user understands and experiences the site. Good navigability improves the understanding of the information by providing access to the information in an appropriate way. Kalbach defines navigation in three ways [1]:

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

In the European Journal of Information Systems a more formal definition has been made by Castro et al., “Navigability in use, defined as the efficiency, effectiveness and satisfaction with which a user navigates through the system in order to fulfil her goals under specific conditions” [18]. This definition clearly states the correlation between navigability and usability. Navigation is one of the means to create usability on a web application. The authors of the previous mentioned study also put great emphasis on the impact the navigation has on the overall success of the web application. Y. Lee and K. A. Kozar state that the ease of navigation has a positive impact on the customer’s attitude [2] and it also has a direct influence on purchase intention [17]. Simplicity and consistency can have a great impact on the navigation. It can affect navigability either positive or negative by providing minimum content and features, and keep a consistent location of this content on each page [17].

2.3.2 Design elements for better navigation

A web application must provide navigation that is self-evident, self-exploratory and intuitive. This can be accomplished by putting navigation controls in the same location across the entire web application [10]. Persistent navigation is a term describing this design approach. It can increase the application's learnability and gives the web page a consistent look. According to Krug, persistent navigation should be used on all pages of the application except on the home page and any page with a form. This navigation design should include elements such as a site
id at the upper left corner, a link to the home page, a way to search, utilities and the links to the main sections of the application [19].

Location is an important aspect of navigation. To assist the user of its location within the web application, indications can be made either by highlighting the current option or by leaving breadcrumbs [1]. Breadcrumbs is a type of secondary navigation schema that aids the user to understand what path it has taken to get to its current location and provides the option to visually trace the path back [20].

Several studies and reports indicate design factors that have a positive impact on navigation. From these a list of important design factors has been compiled [21]–[23]:

- Have a consistent design on every page with name and logo.
- If the web application has more than 100 pages, provide a search engine.
- Use descriptive and straightforward labels on pages and links.
- Limit the number of menu items to seven and avoid drop-down menus.
- Make the web application navigable on mobile devices.
- The navigation on the web application should be similar to other big web applications to ease the user's learnability.

2.4 The Purchasing Process

The online purchasing process is a broad term that involves everything from the way items for sale are displayed to the system used to complete the purchase. The following chapters examines relevant parts of the payment process as well as what makes purchasing easy.

2.4.1 Purchase Intention

There are several factors that impacts the purchasing process and the purchase intention.
In figure 1 Y. Lee and K. A. Kozar describes the causality between different usability factors and how they affect the purchase. The numbers presented between the factors is a value between −1 and 1 indicating the extent of direct cause that one factor have on another. An easy purchasing process is therefore a process supported by these factors. As seen in figure 1, some major factors that affects the purchase intention are content relevance and learnability. Navigability, as described in section 2.3.1, is also one of the factors that has a high direct cause on the purchase intention. All of these factors need to affect the whole process including the payment process. In the payment process it is important to balance the simplicity and complexity, credibility and confidence, and take consideration to user convenience.

Simplicity and consistency are two factors that have a direct impact on navigability and have an indirect impact on the customer’s purchase intention. These two factors are crucial when building a web application with an easy purchasing process [17]. A study by Nielsen shows that users of web applications want to find what they are searching for in a quick manner and they want the information presented in a logical order [24]. This is important in every use of the web application, including the purchasing process. As mentioned, simplicity has a high positive effect on the navigability of a web application, however simplicity has negative effect
on telepresence of the application [17]. Hence the purchase intention and the purchasing process can be negatively affected if the simplicity is too high. It is important to balance the simplicity of the web application to ensure high navigability without reducing other factors that can affect the ease of purchase.

2.4.2 Electronic Payments

An electronic payment can be defined as a financial exchange that takes place online between buyers and sellers [25]. The process of paying for something on the internet has changed drastically in the last 20 years. Since the first financial institution which offered online payment was established in 1994 the purchasing process has changed drastically, and a lot of different purchasing solutions have emerged. According to Serrao and Fonseca there are three variables shaping electronic transactions and commerce: convenience, confidence and complexity [25]. A transaction system that appears to be too convenient and too easy to use often inspires less confidence. A more complex system however, while appearing more secure is with few exceptions seen as less convenient.

An electronic payment service provider is a company that provides services that enables sellers to accept different kinds of online payments [26]. The owner of a website must make a choice whether to develop and manage his or her payment system alone or let an external payment service provider handle the transactions. For the owner, the benefit of using a third-party provider is mainly convenience. The contracted provider handles the technical solutions, security and is responsible for managing the payments. However, what is gained in convenience is often lost in customizability and flexibility [27]. This means choosing the correct purchasing solution can have a large impact on the customers perceived ease to purchase.

2.4.3 Online Purchasing Ease

According to Chapman, [3] one way to make purchasing from a website easy is to simplify checkout process. Not having to go through multiple pages to enter shipping and billing information, review and confirm the final order greatly decreases the risk of the customer abandoning their cart. 41% of the users may abandon their shopping carts if they experience the checkout process complicated and time-consuming [28].

An electronic shopping cart is software that allows the customer to have an overview of selected items before proceeding to choose payment method and confirm order [26]. According to Najjar, users should know what is in their shopping cart at all times [10]. This is done to reduce the need to navigate between pages and to lower confusion during the purchasing process. This is accomplished by having a shopping cart summary on every page except the shopping cart page and checkout pages. The summary should contain a hyperlinked product name for each item, the item quantity, the price for each item and, a total price for the current cart. There should also be links to show the shopping cart in its entirety as well as to the checkout.
Table 1 contains important aspects and functionalities that an online payment system should address to be seamlessly integrated into the web application where the payment takes place [29].

Table 1. Aspects and Functionalities an Online Payment System Should Address

<table>
<thead>
<tr>
<th>Aspect</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acceptance</td>
<td>In order to be successful, the payment infrastructure must be largely accepted.</td>
</tr>
<tr>
<td>Anonymity</td>
<td>Customers’ identity must be protected.</td>
</tr>
<tr>
<td>Conversion</td>
<td>Digital money should be convertible to other types of financial founds.</td>
</tr>
<tr>
<td>Efficiency</td>
<td>Transactions costs must be near zero.</td>
</tr>
<tr>
<td>Flexibility</td>
<td>Different types of payments should be supported.</td>
</tr>
<tr>
<td>Integration</td>
<td>To support the actual applications, proper interfaces should be created for its integration.</td>
</tr>
<tr>
<td>Reliability</td>
<td>Should always be available to avoid potential points of failure.</td>
</tr>
<tr>
<td>Scalability</td>
<td>Should permit the new costumers and merchants entrance without affecting the infrastructure.</td>
</tr>
<tr>
<td>Security</td>
<td>Support the financial transactions security over open networks.</td>
</tr>
<tr>
<td>Usability</td>
<td>Payment should be as easy as in the real world.</td>
</tr>
<tr>
<td>Broader Market</td>
<td>People not eligible for credit cards could use these systems giving a widespread acceptance.</td>
</tr>
<tr>
<td>Trust</td>
<td>Consumers and merchants must have a high degree of confidence on the system trusting that payment are conducted in proper way.</td>
</tr>
</tbody>
</table>

2.5 Development

This chapter describes theories used during the developing process. The process includes surveys, prototypes, brainwriting and development of a web application.

2.5.1 Scrum

Scrum is defined as "a framework within which people can address complex adaptive problems, while productively and creatively delivering products of the highest possible
value."¹ The scrum framework is not regarded as a method, technique or definitive method because the framework should be adaptable and suits therefore different types of projects. Key events included in the scrum framework are the sprint, the sprint planning, scrum meetings and sprint retrospective. A sprint, which is a period that is repeated iteratively, starts with a sprint planning. The work is followed up by scrum meetings in shorter intervals and the sprint ends with a summary done during a sprint retrospective.² Each sprint aims to complete all tasks in the sprint backlog which is a selection of task from the product backlog. The product backlog is a collection of everything that should be implemented in the product.³

2.5.2 Market Survey
A market survey is a way of collecting primary data for online market research [30]. The market survey can be either qualitative or quantitative, where a quantitative method is effective when studying associations between variables, generality of data, and testing hypotheses [31]. When analyzing the data of a survey it is important to consider the representation of the questionnaire participants, the clarity of the question formulations, and if any limitations have affected the measured data [32]. Online questionnaires give a quick data collection with wide distribution and a low cost per questionnaire [33].

2.5.3 Prototypes
A prototype is created to save time and money in a project. When a prototype is done early in the process, the developers and the rest of the project group can get a hint of the work they have to complete. Therefore, the Nielsen Norman group states that valuable time can be saved, and resources are not wasted on designs that may not give the desired effect. The process of doing a website prototype is a rapid iterative design technique that can be made using a digital tool or on paper. According to the Nielsen Norman group a prototype is "one of the best methods for gaining design insight early" [34].

2.5.4 Brainwriting
According to VanGundy, brainwriting is an alternative to brainstorming that is more beneficial to use in certain situations. Brainwriting methods usually require fewer leadership skills to manage, and also assures that the group members have an equal chance to participate. VanGundy describes six different brainwriting techniques where Pin Cards is one of them. In this technique, each group member gets an index card where they write down ideas regarding the specific problem statement. Each card is then passed on to the next person in the group who writes down new ideas, using the ideas on the card for stimulation. This process is repeated for 20 or 30 minutes [35].

¹ http://www.scrumguides.org/scrum-guide.html#definition
² http://www.scrumguides.org/scrum-guide.html#events-sprint
³ http://www.scrumguides.org/scrum-guide.html#artifacts
2.5.5 Web Application

A web application can be defined as a Web in which user input effects the state of the business [36]. A common method when developing a web application is to use the so-called three-tier architecture [37]. The presentation tier uses HTML and CSS to add content and style the client-side of the application. It also makes use of JavaScript to add functionality. The presentation tier is also called the front-end of the application [38]. The logic tier communicates between client and server with either a scripting language like PHP or an object-oriented language such as Python, Java or Ruby. The data tier handles data management, often with the help of Structured Query Language (SQL). Together, the logic tier and data tier are often called the back-end of the application [38].

2.6 User Testing

The meaning of usability testing is to systematically determine the level of usability in an application [39]. This purpose is common to all Usability Evaluation Methods but there are different ways to achieve this goal. A study performed by F. Paz and J. A. Pow-Sang shows that surveys or questionnaires are the most commonly used methods [39].

The System Usability Scale (SUS) is a usability evaluation method that was developed by Brooke [40]. It is well-researched and widely used for all kinds of web applications [41]. The method is a questionnaire with ten statements that are rated on a one-to-five scale. The questions can be found in appendix B. To make the respondents think before answering every question, the questions alternate between being positive or negative. The evaluation is performed directly after the user has tested the web application, and the answers are then compiled to form the SUS score. The SUS score ranges from 0 to 100 where a high score indicates high usability [40]. A SUS score above 68 is considered above average according to a compilation of 500 SUS evaluations, and a score above 80.3 is ranked among the top 10% of the reviewed evaluations. [42]. The advantages of using the System Usability Scale is that it is a quick, easy method that is free to use while being applicable to a variety of different applications. One question of the SUS questionnaire is "I thought the system was easy to use" which can be answered with a high mark by providing good navigability and an easy purchasing process.

2.6.1 How to Test Navigability

There are different methods to test and measure navigability on a web application. One easy to use measure described by Bailey et al. is the First Click Analysis [4]. This method analyzes the users first click on the web application and it is found that if the first click was a success the overall success of the scenario had a chance of 0.87. If, however, the first click was unsuccessful the chance for overall success was only 0.47. Bailey et al. state that collecting first click data “[…] not only helps designers understand where users would look for information but helps to validate an information architecture at the highest level of a Web site.” [4]. Advantages of the first click analysis are that many scenarios can be tested during
each test and tests can be performed early in the development on low fidelity prototypes when only the homepage and the landing page is completed.

2.6.2 How to Test Purchasing Ease

Purchasing ease is according to Chapman, increased by reducing the number of pages the customer must go through to complete a purchase [3]. By measuring the number of clicks required to perform different tasks, it is therefore possible to evaluate how easy the user perceives the purchasing process to be. Purchasing ease is closely connected to the simplicity of the process. Y. Lee and K. A. Kozar states that one item that indicates simplicity is that it is possible to comprehend the components on each page of a web application in a short amount of time [17]. That means that testing the time it takes to complete a task is a relevant indicator of purchasing ease. A user test need to be systematic, repeatable, documented and specified. This is criteria for a formal test regardless of the type of testing performed [43].

2.6.3 Who Should Test

When conducting user testing on web applications it is important both to consider how many participants the test involves and how many times the test is performed. Some experts claim that it is more efficient to perform multiple tests than to conduct the test with many participants [44], [19]. The number of usability problems found in a usability test can be calculated by using this equation [45]:

\[ N(1 - (1 - L)^n) \]  

(Eq 1)

where \( N \) is the number of problems of usability in the design, \( n \) is the number of participants and \( L \) is the percentage of usability problems found in the test by one user. J. Nielsen and T. K. Landauer concluded in their study that with each addition of participants only a small amount of additional information will be found about possible usability problems. A test with more than 15 participants will discover all usability problems, however, five participants will discover 85% of the problems [45]. This is the result when \( L \) is equal to 31%. Experiments performed by Virzi show that 80% of all usability problems in the design are detected in a test with four or five participants [46]. J. Nielsen and T. K. Landauer also stated that in a medium example project, the number of test participants equal to four gave the maximum value when considering both cost and benefit [45].

The above-mentioned studies claim that five participants are not enough to find 85% of usability problems [47]. Their study indicates that J. Nielsen and T. K. Landauer equation is useful, but the calculation of \( L \) needs higher consideration.

According to Krug the test participants should reflect the intended target group, however it does not have a major impact on the result of the test. It is therefore better to find willing participants with approximate similarity to the intended target group, or if needed any willing participants, than to struggle to find participants that exactly match. This will reduce the effort of the usability test and make it possible to perform the test more times [19].
3 Method

This chapter describes the methods that have been used to answer the research question. Methods used during the pre-study includes a market survey and the creation of a prototype. The implementation describes the programming tools used for the web applications construction regarding both front-end and back-end. The last section describes the evaluation process with user testing.

3.1 Pre-study

Prior to developing the product, a pre-study was made to gain a better understanding of the market and the demand.

3.1.1 Market Survey

To get valuable input about the product idea from potential end users, a market survey was created using Google Forms. The survey was shared in eight different Facebook groups with the goal to reach as many students as possible at Linköping University. It consisted of eight multiple choice questions to be easy and time efficient for the participants as well as unambiguous giving great insight in the needs for the web application. The result, which can be found in appendix A, was collected after four days. The survey was originally in Swedish, but the translated multiple-choice questions can be found below. Blå Havet is a square situated right in the heart of the campus area at Linköping university.

- What would make you buy lunch more often from a food truck at Blå Havet?
  - To be able to see when food trucks are available
  - To be able to see menus ahead of time
  - Shorter queues
  - Easier to find alternatives for dietary specifications
  - Easier to make orders for many people at the same time
  - Cheaper price
  - To be able to preorder food to a specific time
  - To be able to order food from a website

- Rank where you eat lunch most often
  - Lunch box brought from home
  - Food truck at Blå Havet
  - Other restaurants

- How often do you eat lunch from a food truck?
  - More than 3 times a week
  - 1-2 times a week
  - 1-2 times a month
  - More rarely/never

- When do you decide to eat lunch from the food trucks?
  - The day before
The same day before lunchtime
- During lunchtime
- I do not buy food from the food trucks

- Would you be interested in an online service for buying food from food trucks ahead of time?
  - Yes
  - No

- Do you think that an online service would increase your consumption of food from the food trucks?
  - Yes
  - No

- Are you a student at Linköping University?
  - Yes
  - No

- How old are you?
  - Under 20 years
  - 20-25 years
  - Over 25 years

3.1.2 Prototype

A brain writing method described by VanGundy, called Pin Cards, was used in order to come up with functionality and feature ideas [35]. During the Pin Cards session, each member of the group wrote down three ideas on a piece of paper. The papers were then passed around the group until everyone had written three ideas on each paper. This technique led to 192 ideas that were transferred to a Microsoft Excel spreadsheet where duplicates were removed. The ideas were grouped into different categories and then further categorized into necessary, desired, and unnecessary functionalities. With the necessary features as a basis, prototypes were created using the website Wireframe, where it was possible to represent the skeletal framework of the web application. Since the tool is very basic, this method was chosen to only focus on the functionality, behavior, and content. Several prototypes were created to experiment and test different layouts. The group then had a vote on which prototype to use.

3.2 Implementation

This section will include how the web application was implemented and the methods and tools that were used.
3.2.1 Front-end

The Programming languages that were used were HTML, CSS, and JavaScript. HTML was used to define the content on the web page and CSS to design the look of it. Bootstrap\(^4\) was used for basic styling of the website and responsive design. JavaScript helped create an interactive website and communicate with the back-end. Widely recognized and used frameworks and libraries were chosen because of the amounts of accessible information about them on the internet. The jQuery-library eased the process of writing JavaScript and through the AJAX-commands the communication with the server was executed.

3.2.2 Back-end

The back-end includes a server, the applications running on the server and a database. A microframework for Python called Flask\(^5\) that is based on the frameworks Werkzeug and Jinja2 was used. Flask is designed for web development and was used together with Jinja to dynamically load information onto web pages without reloading it. FlaskAdmin was used to create an administrator page that could handle the database.

A database was used to store all the information about the food trucks, such as menus and prices. SQLite was used to implement the database. To manage the database, which was written in SQL, the Flask plugin SQLAlchemy was used. It acted as a translator between Python and SQL and enabled the use of Python commands to access the database. All Flask plugins that were used can be found in Appendix F.

3.3 Evaluation

This section describes the methods used to evaluate the implemented web application.

3.3.1 User Testing

As mentioned in the introduction, the aim was to research how to deliver a product with high usability with regards to navigability and an easy to use purchasing solution. Consequently, these areas were the main focus when evaluating the web application. To evaluate these specific areas, user tests were performed in sprint 1, 2, and 3. Each test was performed on a test group consisting of five students. The size of the test group was determined by the result of J. Nielsen's and T. K. Landauer's and Virzi’s studies \([45], [46]\). The test participants were students at the Linköping University and therefore reflected the intended target group. The tests described below were performed at the end of sprint 1-3, and to be able to see the progression over time, the tests were performed in similar ways each sprint with different test participants.

\(^4\) https://getbootstrap.com/
\(^5\) http://flask.pocoo.org/
All three tests were conducted by two test leaders that guided one participant at a time through the different tasks. Before the user test was initialized, the test leaders performed the task to purchase a meal and measured the optimal number of clicks. When performing the task using the optimal number of clicks, the time was measured to determine the reasonable time to perform the task. The correct path for all tasks was also documented. At the beginning of the test, the two test leaders greeted one participant at a time and explained the overall purpose of the user test. The participants got access to the web application and were asked to perform the below mentioned tasks. One test leader focused on taking notes and the other one focused on guiding the participants. After the participants had performed the given tasks, they were asked to anonymously answer the SUS questionnaire.

A method described by Bailey et al. called First Click Analysis was used to test the navigability of the application [4]. In this analysis, the five new test participants each sprint were asked to purchase a meal starting from the home page. Without telling the test user that they were participating in a first click test, their first click on each page was documented as either correct or wrong. To test the purchasing flow, the number of clicks that the test participant used to complete the task was written down, and the time elapsed was measured using a timer. According to Chapman, the checkout process should be quick and simple to make the purchase flow easy [3]. If the number of clicks was too high, or the time elapsed was too long, the purchasing flow had to be reconsidered. The number of users whose first click was correct was also analyzed. If the number turned out to be low for the certain task, the design of the web application had to be discussed and potentially changed to increase the navigability.

Another first click analysis was performed by telling the participants to try to find the opening hours for the trucks. The participants started at the home page and then their first click was analyzed. If the number of users whose first click was correct turned out to be low, the design had to be discussed and potentially changed to increase the navigability. During sprint 2 and 3, two out of five participants performed this part of the test before purchasing a meal and the rest purchased a meal before finding the opening hours for the trucks. During the test in sprint 2 and 3 an extra first click analysis was performed. This analysis concerned the process of the food truck vendor when dealing with orders. The task was to mark an order as delivered. The participants started from the home page and their first click was analyzed. This test was executed last of the navigation tasks in both sprint 2 and 3.

After the navigation and purchasing tests, the System Usability Scale (SUS) by Brooke was used to measure the usability of the web application [40]. The test participants were given a ten-item questionnaire where they had to fill in whether they agreed or disagreed with the statements on a five-point scale. The answers were converted into numbers and calculated to form the SUS score. If the SUS score turned out to be low, the usability of the application had to be revised. If the test participants made other comments or suggestions during the test, these inputs were taken in consideration in the coming sprints.
After the final test in sprint 3, the SUS score from the three sprints were compared to see the progression over time. The result from the tests in sprint 3 was analyzed to determine if the final web application had high usability, navigability, and an easy to use purchasing solution.
4 Result

This section presents the outcome and the result of the pre-study, implementation and evaluation. The result of the pre-study includes result of the market survey and the constructed prototypes. The result of the implementation shows how the web application have been developed during the construction. The last section shows the result of the performed user tests.

4.1 Pre-study

This section presents the outcome and result of the market survey and the prototype that was done after the brainwriting session.

4.1.1 Market Survey

The market survey was published the 23rd of January 2018 and the responses were collected four days later. The spread of the survey is hard to calculate but given that it was posted in eight different Facebook groups, all of them consisting of more than 200 individuals, the result was satisfying. By estimate, approximately 800 individuals were reached by the market survey regarding that several individuals were duplicates in the Facebook groups. What could be concluded exactly is that 152 people participated and gave their answers in the market survey.

The most useful results from the market survey are that a majority of the participants answered that they believe an online service, like the developed web application LunchHero, would increase their consumption from the food trucks at the square Blå Havet. This can be seen in figure 3. Another question, shown in figure 2, shows that 55,3 % of the participants decide before the lunch break whether they will buy lunch from the food trucks or not. The age distribution of the market survey is clear and speaks for itself since 96,1 % of the participants are between 20 – 25 years old, see figure 4.

![When do you decide to eat from the food trucks?](image)

*Figure 2. The Result of the Survey Question “When do you decide to eat from the food trucks?”*
Do you think that an online web-service would increase your consumption from the food trucks?

Figure 3. The Result of the Survey Question “Do you think that an online web-service would increase your consumption from the food trucks?”

How old are you?

Figure 4. The Result of the Survey Question “How old are you?”

The market survey as it was posted originally can be found in Appendix A and section 3.1.1 Market Survey, shows a translated version of the same survey.

4.1.2 Prototype

The brainwriting method, Pin Cards, led to 192 ideas of possible functionalities to implement in the web application. When categorizing the ideas into necessary, desired and unnecessary functionalities, the group agreed on the following ideas to be necessary:

- Display opening hours for the trucks
- Shopping cart
- Be able to add food to the shopping cart
- Be able to edit in shopping cart
- Show total amount of food in shopping cart
- Be able to choose pick-up time
- Show chosen pick-up time
- Order confirmation
- Be able to pay with card
- Be able to navigate between food trucks
- Show web application logo
- Show description of food trucks
- Simple design
- Scalability
• Show food name and price
• Show food truck name
• Contact page
• Food truck page
• Log in as a food truck user
• Be able to see order history on food truck page
• Be able to clear orders on food truck page

With the necessary functionalities as a basis, four different prototypes were created to experiment with different layouts and designs. In appendix D the four prototypes are shown in figure 1-8. Figure 1 shows a prototype of what the home page could look like. Figure 2 and 3 shows different prototypes of the menu page. Figure 4-8 show a prototype of the whole purchasing process.

A combination of prototype 1, 2, and 4 was used when implementing the web application. The web application was going to have a purchasing flow like prototype 4 but with a home page like prototype 1. The menu page would be implemented like prototype 2 but without the possibility to change food truck. The food truck would be chosen before going into the menu page, as in prototype 4. It was also decided that the web application would have a shopping cart that would be visible throughout the whole purchasing process. Prototype 3 was not used since prototype 2 had a more appealing design and therefore was preferred.

4.2 Implementation

This section describes the result of the implementation of the web application regarding both the front-end and the back-end. The result shows the iterative process of the development.

4.2.1 Front-End

The Frond-end for LunchHero was developed using HTML, CSS and JavaScript together with jQuery and Bootstrap. The rendered design was written in HTML, CSS and Bootstrap. JavaScript was used in some instances to load certain content into the web browser while Ajax (jQuery) was used for server calls.

The front-end design of the page was created with HTML templates. Content was fetched from the server using both Ajax requests and regular requests. Mentioned requests differ and could consist of entire HTML templates or products that are currently in the shopping cart. These products often contain different data like name, price or similar attributes. Using the Flask framework, these variables can be printed as text and then inserted into HTML-tags.

4.2.1.1 Sprint 1

The first sprint focused on developing and establishing a core interface of the web application and the first front-end build of the web application which consisted of in total three pages. The page contained a navigation bar containing short-links to all the different pages and the
admin page. The main page also included a jumbotron containing a button which was used to navigate to the Truck page where all available food trucks are shown. Additionally, there were three large glyphicons which were used to show the order flow. A footer with copyright and the LunchHero name was also present on all pages, this can be shown in figure 5.

**Figure 5. The Home Page - Sprint 1**

The Truck Page

Figure 6 shows the truck page which was loaded using jQuery load. All food trucks were fetched using this method and showcased in an in-line list with clickable jumbotrons. These contained a header with the name of the food truck, opening hours and two labels. If clicked upon the jumbotron expanded and showed additional details, opening hours and a Bootstrap button “Till menyn”.

**Figure 6. The Truck Page - Sprint 1**
The Menu Page
Figure 7 shows the menu page which contained two containers for the menu and for the shopping cart. The menu was loaded using jQuery load while the shopping cart was loaded using Ajax. As a list was used to keep track of all the courses in the shopping cart it was converted to JSON format. The menu container had a headline “VÄLJ MATRÄTT” and an in-line list of all the courses showing the name and the price of each course. The shopping cart container showed a headline “Shopping Cart” and beneath a list of all titles and prices of the dishes in the cart. In the end it contained a title “Total kostnad: “ and an integer element which showed the total current value of the cart plus a “Pay with Card” button from the Stripe API.

4.2.1.2 Sprint 2
At the end of sprint 2, the application had undergone an aesthetic overhaul. The application was adapted for mobile sized screens, and several new features were implemented. A login page for the food truck user was added. When logged in, a food truck user was now greeted with the order administration page, making it possible to manage both pending orders and the order history. On the truck page, the feature “Trucktoppen” ranked the trucks with the most orders at any given moment. The time page, where users could select time for pick-up of their food, was another page implemented during this sprint. When confirming an order, an email-confirmation was sent to the buyer with relevant information regarding the purchase.

The Updated Home Page
As part of the major redesign of the application, the home page received an updated look. This look is shown in figure 8. A background image was added, spanning the whole width of the screen. The button redirecting the user to the truck page was enlarged to emphasize its importance. In the navbar, the “payment”, “placeholder” and “menus” buttons were removed, and a “contact” and a “login” button were added.
The restructured truck page, shown in figure 9, now displayed the available information about the trucks without the need to press a button. This information was located to the left of the screen in a white box. Clicking anywhere on the images of each truck now forwarded the user to the menu page. At the top of the page, “Trucktoppen” showcased the three most popular trucks, giving them more exposure than they otherwise would have gotten. The “Öppet” and “Förbeställ” buttons were enlarged. A background-image displaying a food truck was added.

The Updated Menu Page
The menu page received no major functionality changes during sprint 2. The exception was
changing the shopping cart link from linking directly to the payment screen to instead leading the user to the time page to select pick up time. Visually, the menu page received similar updates as the other pages. This can be seen in figure 10. A background image was added below the updated navbar. The menu design remained largely the same, while the appearance of the shopping cart got an update.

![Menu Page - Sprint 2](image)

**Figure 10. The Menu Page – Sprint 2**

**The Time Page**

The time page, shown in figure 11, functioned as a way to let the customers select when to pick up the chosen food. The page displayed the five coming days in the calendar. If the chosen truck was closed at a given day, no times were shown. The days the truck was open the available pick up times were shown in quarterly intervals with one hour being represented by one column. Times already passed were greyed out and made unclickable. As on the menu page, the shopping cart was made visible at all times. The “Betala” button at the bottom of the shopping cart redirected the user to the payment page. Until the user selected a time for pick up, this button was disabled.
The Order Administration Page

The order administration page gave the food truck user a way to manage orders. When logging in, the user was greeted with the name of the truck as well as a personalized background image. A view of the page is shown in figure 12. When pressing the “Kommande order” button, a list of orders not yet delivered was displayed. Each list item corresponded an order and showed order number, desired time and date of pick up, what food had been ordered, and a checkbox indicating if the order had been delivered. Checkboxes were all unchecked on the “Kommande order” page. When checking a box, the order got marked as delivered in the database. When pressing the “Orderhistorik” button, orders that already had been delivered was shown in a similar fashion as on the “Kommande order” page. The user was given the option to uncheck individual orders. When doing this, the order was moved back to “not delivered” in the database. Both the “Kommande order” page and the “Orderhistorik” page had an update button labeled “Uppdatera”, which refreshed the displayed list of orders to the updated version after the user was pleased with his or hers changes. To access the order administration page from another part of the application, a link in the navbar was added. This link was only shown when a food truck user was logged in.
The Login Page
The login page acted as verification for the food truck owners and was accessed through a link in the navbar. It consisted of a simple form where the user entered a user name and password to log in. It also contained a “remember me” option, and a “sign in” button. When signing in, the user was redirected to the order administration page and the sign in button was replaced by a sign out button. The navbar and background image had a similar design as most of the other pages of the application.

The Payment Page
When the user pressed the “Betala” button the payment page appeared as shown in figure 13. This page was powered by Stripe’s payment solution. The user was asked to enter an email address and his or her payment information. If desired, the "Remember me" button gave the option to make future purchases faster by remembering the buyer’s payment information. The stripe payment button acted as the point of no return. This button displayed the final order price. When pressed, an order was submitted to the database containing all relevant information and appeared on the order administration page accessible by the affected food truck.

![Image of the payment page](image)

Figure 13. The Payment Page – Sprint 2

The Order is Being Processed Modal
A modal was added that appeared on the screen simultaneously as the payment was being verified, the customer’s order was being saved in the database and an order confirmation email was sent to the customer. This process took approximately two to six seconds, tested on the developers’ computers. Most of the loading time was due to the process of sending the email. The loading screen can be shown in figure 14.
The Email Confirmation
An order confirmation email was sent out as the payment was being verified. The email contained a receipt of the order that the customer had placed to the food truck. The email contained an order number, as well as additional information such as which meals were ordered, their price and at what time and date the meal was to be collected.

The Order Confirmation Page
The payment complete page, shown in figure 15, contained a receipt of the performed transaction. It contained the food ordered as well as the price of the ordered food. Both individual prices of each food item and total order price was displayed. The receipt also contained an order number, the name of the truck, the time the order was placed and the estimated delivery time.
Mobile Customization

During sprint 2, the majority of the website was made responsive with the help of bootstrap. The different web pages changed depending on screen size, each page to a different degree. Two examples is shown in figure 16. The shopping cart was made hidden by default and accessed through a dropdown button. When pressed, the shopping cart appeared with a similar look as the desktop version and occupied most of the screen, with either the time page or the menu page in the background. On the shopping cart button, a number was made visible, indicating the current number of courses in the cart. Both the truck page and the order page retained their overall design, with all their functionality intact.
4.2.1.3 Sprint 3
During sprint 3 there were no big changes to the website. Small additions were made to make the whole application more cohesive. The navigation bar was changed, and unnecessary alternatives were removed, also the language in the navigation bar was changed to Swedish. A new background picture was added to the homepage with a picture showing the on-campus location of the food trucks, shown in figure 17. In addition, the text under the glyphicons on the homepage was changed from “lorem ipsum”-text into Swedish. It describes, shortly, the process of ordering food through the web application.
Figure 17. The Home Page – Sprint 3

The Truck Page

During sprint 3, a box to show the opening times of the food trucks was implemented. The box displayed the opening time of the present and the four upcoming days. In addition, every truck got their own unique background picture. With this change, the mobile version of the truck page got adjusted with a box for the description of the food truck. Also, the opening times were displayed beneath the description while on a mobile device. The open or closed sign was connected to the actual opening times, displaying “Stängt” when closed and “Öppet” when open. The truck page for desktops is shown in figure 18 and the mobile version is shown in figure 19.
Figure 18. The Truck Page – Sprint 3
The Time Page
One function was added to the time page this sprint. The function showed what time the user had chosen to pick up its order, this is visualized in figure 20. It was displayed on top of the page. This was added to aid the user through the purchasing process and to present the information needed to continue to the next step.
During sprint 3 the email confirmation got an update, see figure 21. The old concept of having images in the HTML code was not accepted by the major email services like Gmail and Outlook, because of their email firewalls and spam filters. Therefore, LunchHero’s email confirmation was coded with HTML and CSS and all icons and images were removed during sprint 3. The email confirmation was made in the same style as the web application where the customer recognizes the brand name from the navbar of the web application. The paragraph tag for “Ny beställning?” is clickable and redirects to “lunchhero.se” which is a fictitious web domain since the web application is not launched online on a web server.
4.2.2 Back-end

The back-end part of the web application was built using the following frameworks and application programming interfaces. The Python web server was constructed using the Flask framework. The HTML documents of the web application were mainly rendered in the back-end using the Jinja2 template engine. The application data was stored in an SQL database using SQLAlchemy as an intermediary for object relational mapping, i.e. communicating with the database from the Flask interface.

4.2.2.1 Sprint 1

During sprint 1 the foundation for the back-end functionality was laid down by creating a database and an admin page.

Database

To store information in an efficient manner a database was used. As the application continued to develop during the different sprints the database changed its structure and more entities were added. The initial draft of the database was made in sprint 1 and included the entities “Truck” and “Food”. These relations can be visualized in figure 22.
The “Truck” entity contained information about the trucks connected to the web application such as the name, a short description and opening and closing times of the truck. This initial way to represent the opening hours had restricted functionality, since it required the truck to have the same opening hours every day of the week. This was later changed to make the hours more flexible, which was seen as more realistic and useful. Each truck had a variety of different courses stored as food entities. When a user clicked on the link corresponding to a specific truck the courses linked to this truck in the database were displayed on the menu page described in the front-end chapter.

The “Food” entity contained information about the different courses offered by the trucks. Each food entity had a title and a short description. Information regarding if the courses were vegetarian, gluten free etc. was stored as well. This was displayed together with the name and information to make it easy for the buyer to make an informed decision when deciding what to purchase.

![EER Diagram - Sprint 1](image)

**Figure 22. EER Diagram - Sprint 1**

**The Admin Page**
Flask Admin was used to make changes to the content of the database in an easy way. The admin page made it possible to add new trucks and courses without the need to go through the shell. When more entities were added to the database, these too were added to the admin page for easy access. To limit the access to the admin page by requiring a username and a password the extension Flask-BasicAuth was used.

**4.2.2.2 Sprint 2**
In this sprint some substantial updates were made to the back-end part of the constructed web application. The database was updated with more entities and the previously integrated single-page application was partly reverted.
Updated Database and EER
During the second sprint the database was extended substantially to include more entities and some reorganization of the tables, columns, and the interconnections between the entities. The entities “Day”, “User”, “Order”, and “Ordered Food” were implemented along with their corresponding attributes as seen in figure 23. The “Day” entity allowed the Truck to have more customization to the opening hours rather than the previous implementation with a static opening hour and closing time. Every “Day” is connected to the “Truck” by the trucks “Id”. The User entity is essentially the log in for the food truck and is used on the foodtruck-page. The password was hashed and salted before storing the details in the database using Werkzeug.

Figure 23. EER Diagram - Sprint 2

Single-page Application
The implemented Single-Page Application design of the web application was reverted to only be used on the menu and time pages as well as the Stripe modal. This allowed the user to refresh the page and use the back button in the web browser. This was accomplished by using an inherent JavaScript function instead of relying on Ajax’s load function.

Email
During this sprint the Flask Email module was added and implemented. An email account was configured on the Flask server using a pre-made Gmail account with a built in SMTP server. The mail service was set up to send an email from the server hosting the application to the user in two instances. Firstly, when the user sends a plain text email using the contact form.
Secondly as an order confirmation email when the user finishes the payment process and the payment is verified.

### 4.2.2.3 Sprint 3

Sprint 3 consisted of minor updates, the main changes entailed improvements of the email functionality.

**Updated Email Functionality**

During sprint 3, one of the main pieces of added functionality is that the order confirmation email from the web server to the user is sent after the payment is completed, at the same time as the order confirmation webpage was being rendered. Previously the email was sent prior to the rendering of the order confirmation webpage. Since the customer’s email address was included in the server call after the payment was completed, this change made it possible to direct an order confirmation email directly to the intended recipient rather than to an internal test address. An effect of modifying and moving the order confirmation email code was that the amount of time the loading screen, mentioned in section 4.2.1, was visible to the user was reduced from a couple of seconds to less than a second.

In addition to this, the email address obtained from the contact form created in sprint 2 was added to the content of the contact email. Thus, making it possible to obtain the inquirer’s email address and respond to any potential questions they might have.

### 4.3 Evaluation

This section presents the result from the user tests that were performed in sprint 1, 2, and 3.

#### 4.3.1 Sprint 1

Five students at Linköping University participated in the first test conducted at the end of sprint 1. All five participants were students in Industrial Engineering and Management.

**First Click Test – Order an Arbitrary Course**

Table 2 shows the result from the test of the purchasing process where the test participants were asked to order a course from a food truck starting from the home page. As the results show, all participants but one chose the correct path. One test participant clicked on the wrong button while asked to navigate to the truck page. Therefore, the design of this page was simplified in the next sprint.

*Table 2. First Click Analysis – Order an arbitrary course - Sprint 1*

<table>
<thead>
<tr>
<th>Test user</th>
<th>Home page</th>
<th>Choose food truck page</th>
<th>Choose food page</th>
<th>Choose food page - Start payment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Correct</td>
<td>Wrong</td>
<td>Correct</td>
<td>Correct</td>
</tr>
<tr>
<td>2</td>
<td>Correct</td>
<td>Correct</td>
<td>Correct</td>
<td>Correct</td>
</tr>
<tr>
<td>3</td>
<td>Correct</td>
<td>Correct</td>
<td>Correct</td>
<td>Correct</td>
</tr>
<tr>
<td>4</td>
<td>Correct</td>
<td>Correct</td>
<td>Correct</td>
<td>Correct</td>
</tr>
<tr>
<td>5</td>
<td>Correct</td>
<td>Correct</td>
<td>Correct</td>
<td>Correct</td>
</tr>
</tbody>
</table>
Table 3 shows the time elapsed and the number of clicks that each test user used to go through the purchasing flow. The minimum number of clicks was four and as the results show only one participant exceeded that number. The reasonable time was set to 15 seconds, which four out of five participants exceeded.

Table 3. Time and Clicks - Sprint 1

<table>
<thead>
<tr>
<th>Test user</th>
<th>Time (in seconds)</th>
<th>Clicks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>50</td>
<td>5</td>
</tr>
<tr>
<td>2</td>
<td>16.5</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>16.5</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>14.5</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>14</td>
<td>4</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td><strong>22.3</strong></td>
<td><strong>4.2</strong></td>
</tr>
</tbody>
</table>

**First Click Test - Opening Hours**

Table 4 shows the result from the second test where the participants were asked to find the opening hours of the food trucks starting from the home page. Since three of the participants chose the wrong path when trying to find the opening hours.

Table 4. First Click Analysis Opening hours - Sprint 1

<table>
<thead>
<tr>
<th>Test User</th>
<th>Home Page</th>
<th>Choose food truck page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Correct</td>
<td>Correct</td>
</tr>
<tr>
<td>2</td>
<td>Correct</td>
<td>Correct</td>
</tr>
<tr>
<td>3</td>
<td>Wrong</td>
<td>Wrong</td>
</tr>
<tr>
<td>4</td>
<td>Wrong</td>
<td>Wrong</td>
</tr>
<tr>
<td>5</td>
<td>Wrong</td>
<td>Wrong</td>
</tr>
</tbody>
</table>

**System Usability Scale**

Table 5 shows the results from the system usability scale test made in the end of sprint 1. The test subjects were asked series of questions regarding the systems usability. As can be seen in the table, the final SUS score was 75.375.
Table 5. System Usability Scale Test – Sprint 1

<table>
<thead>
<tr>
<th>Question</th>
<th>Test Subjects</th>
<th>Normalized Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I think that I would like to use this system frequently</td>
<td>3 3 4 4 4</td>
<td>2.6</td>
</tr>
<tr>
<td>2. I found the system unnecessarily complex</td>
<td>2 4 1 3 1</td>
<td>2.8</td>
</tr>
<tr>
<td>3. I thought the system was easy to use</td>
<td>3 2 4 4 4</td>
<td>2.4</td>
</tr>
<tr>
<td>4. I think I would need the support of a technical person to be able</td>
<td>1 1 1 1 1</td>
<td></td>
</tr>
<tr>
<td>5. I found the various functions in this system were well integrated</td>
<td>3 3 3 3 5</td>
<td>2.4</td>
</tr>
<tr>
<td>6. I thought there was too much inconsistency in this system</td>
<td>2 5 - 1 1</td>
<td>2.75</td>
</tr>
<tr>
<td>7. I would imagine that most people would learn to use this system very</td>
<td>4 3 5 5 5</td>
<td>3.4</td>
</tr>
<tr>
<td>8. I found the system very cumbersome to use</td>
<td>2 4 1 1 1</td>
<td>3.2</td>
</tr>
<tr>
<td>9. I felt very confident using the system</td>
<td>3 2 4 5 5</td>
<td>2.8</td>
</tr>
<tr>
<td>10. I needed to learn a lot of things before I could get going with this</td>
<td>1 2 1 1 1</td>
<td>3.8</td>
</tr>
<tr>
<td>Strongly disagree = 1; Strongly agree = 5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SUS score 75.4</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4.3.2 Sprint 2

There were five participants in the user test sprint 2. The first three testers initially tested the purchasing process followed by the other tests. The last two testers tested the location of the opening hours first. Three testers were students in Industrial Engineering and Management, one in Computer Science, and one in Applied Physics and Electrical Engineering.

First Click Test – Order an Arbitrary Course

As seen in table 6, all test participants managed to purchase an arbitrary food item in seven clicks. No participants clicked in the wrong place or stopped for an extended period to locate themselves, even though the task required more clicks than the test performed in sprint 1. The reasonable time was measured to 38 seconds. Three of the test users exceeded this time as table 7 shows.
Some remarks that were made by the test participants were that the chosen time on the time page should be more clearly presented and not only change color of the time-box. Also, the opening hours for the different trucks should be easier to find.

**First Click Test - Opening Hours**

Table 8 shows the result from the opening hours first click test. When performing the first click test to find the opening hours of a truck, not one of the test subjects managed to find the information on the first try, and one of the subjects did not manage to find the opening hours at all. This user had never gone through the purchasing process, and therefore never seen the time page. All three test users that already had gone through the purchasing process once managed to find the opening hours after searching for some time. One user suggested to place the opening hours earlier in the purchasing process, preferably on the truck page.

**Table 8. First Click Analysis - Opening hours – Sprint 2**

<table>
<thead>
<tr>
<th>Test user</th>
<th>Home page</th>
<th>Truck page</th>
<th>Choose food</th>
<th>Go to time page</th>
<th>Press “Pay” in shopping cart</th>
<th>Confirm payment (stripe)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Correct</td>
<td>Correct</td>
<td>Correct</td>
<td>Correct</td>
<td>Correct</td>
<td>Correct</td>
</tr>
<tr>
<td>2</td>
<td>Correct</td>
<td>Correct</td>
<td>Correct</td>
<td>Correct</td>
<td>Correct</td>
<td>Correct</td>
</tr>
<tr>
<td>3</td>
<td>Correct</td>
<td>Correct</td>
<td>Correct</td>
<td>Correct</td>
<td>Correct</td>
<td>Correct</td>
</tr>
<tr>
<td>4</td>
<td>Correct</td>
<td>Correct</td>
<td>Correct</td>
<td>Correct</td>
<td>Correct</td>
<td>Correct</td>
</tr>
<tr>
<td>5</td>
<td>Correct</td>
<td>Correct</td>
<td>Correct</td>
<td>Correct</td>
<td>Correct</td>
<td>Correct</td>
</tr>
</tbody>
</table>
First Click Test – Truck Worker Page
During the testing of the order administration page two test participants pressed the temporary admin button instead of the login button, which impacted the test score in a negative way. Among the remaining three participants two managed to go through the process without fail. The last participant clicked the “order history button instead of the pending orders button. The results from this test is presented in table 9. A suggestion to make the order administration page visible immediately when logging in was expressed by one of the test subjects.

<table>
<thead>
<tr>
<th>Test user</th>
<th>Login – Navbar</th>
<th>Sign-in button</th>
<th>Pending orders button</th>
<th>Mark order</th>
<th>Update</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Wrong</td>
<td>Correct</td>
<td>Correct</td>
<td>Correct</td>
<td>Correct</td>
</tr>
<tr>
<td>2</td>
<td>Correct</td>
<td>Correct</td>
<td>Correct</td>
<td>Correct</td>
<td>Correct</td>
</tr>
<tr>
<td>3</td>
<td>Correct</td>
<td>Correct</td>
<td>Correct</td>
<td>Correct</td>
<td>Correct</td>
</tr>
<tr>
<td>4</td>
<td>Wrong</td>
<td>Correct</td>
<td>Correct</td>
<td>Correct</td>
<td>Correct</td>
</tr>
<tr>
<td>5</td>
<td>Wrong</td>
<td>Correct</td>
<td>Wrong</td>
<td>Wrong</td>
<td>Correct</td>
</tr>
</tbody>
</table>

System Usability Scale
The average SUS score among the five participants were 81.5, which was an increase of 6.1 units compared to the performed test in sprint 1. See table 10 for the complete test result. The only question to receive a worse score than the previous test was question 8, “I found the system was very cumbersome to use.”, which went from an average of 3.2 in test one down to 2.6 in test two. Question 1, “I think that I would like to use this system frequently”, and question 5, “I found the various functions in this system were well integrated”, saw the most notable increases in test score when comparing the different tests.
Table 10. System Usability Scale Test – Sprint 2

<table>
<thead>
<tr>
<th>Question</th>
<th>Test Subjects</th>
<th>Average</th>
<th>Median</th>
<th>Normalized Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I think that I would like to use this system frequently</td>
<td>1 4 4 5 5</td>
<td>4.4</td>
<td>4</td>
<td>3.4</td>
</tr>
<tr>
<td>2. I found the system unnecessarily complex</td>
<td>1 4 2 2 2</td>
<td>2.2</td>
<td>2</td>
<td>2.8</td>
</tr>
<tr>
<td>3. I thought the system was easy to use</td>
<td>4 3 5 4 3</td>
<td>3.8</td>
<td>4</td>
<td>2.8</td>
</tr>
<tr>
<td>4. I think I would need the support of a technical person to be able to use this system</td>
<td>1 1 1 1 1</td>
<td>1</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>5. I found the various functions in this system were well integrated</td>
<td>5 4 5 4 4</td>
<td>4.4</td>
<td>4</td>
<td>3.4</td>
</tr>
<tr>
<td>6. I thought there was too much inconsistency in this system</td>
<td>2 2 2 2 1</td>
<td>1.8</td>
<td>2</td>
<td>3.2</td>
</tr>
<tr>
<td>7. I would imagine that most people would learn to use this system very quickly</td>
<td>5 4 5 5 4</td>
<td>4.6</td>
<td>5</td>
<td>3.6</td>
</tr>
<tr>
<td>8. I found the system very cumbersome to use</td>
<td>1 3 4 1 3</td>
<td>2.4</td>
<td>3</td>
<td>2.6</td>
</tr>
<tr>
<td>9. I felt very confident using the system</td>
<td>4 4 3 5 4</td>
<td>4</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>10. I needed to learn a lot of things before I could get going with this system</td>
<td>2 1 1 1 1</td>
<td>1.2</td>
<td>1</td>
<td>3.8</td>
</tr>
</tbody>
</table>

Strongly disagree = 1; Strongly agree = 5

SUS Score 81.5

4.3.3 Sprint 3

The five participants were all students in Industrial Engineering and Management at Linköping University. Participant 1, 2 and 4 initially tested the purchasing process followed by the other tests. Testers 3 and 5 tested the location of the opening hours first.

First Click Test – Order an Arbitrary Course

During the task to order a meal from a food truck all the participants clicked the first click correctly on all pages. The process went smoothly without any problems or errors. Some participants ordered more than one course and they had a higher number of total clicks. In table 11 the path of the process is shown.
Table 11. First Click Analysis - Order an arbitrary course – Sprint 3

<table>
<thead>
<tr>
<th>Test user</th>
<th>Home page</th>
<th>Choose food truck page</th>
<th>Choose food</th>
<th>Go to time page</th>
<th>Choose pick-up time</th>
<th>Press “Pay” in shopping cart</th>
<th>Confirm payment (stripe)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Correct</td>
<td>Correct</td>
<td>Correct</td>
<td>Correct</td>
<td>Correct</td>
<td>Correct</td>
<td>Correct</td>
</tr>
<tr>
<td>2</td>
<td>Correct</td>
<td>Correct</td>
<td>Correct</td>
<td>Correct</td>
<td>Correct</td>
<td>Correct</td>
<td>Correct</td>
</tr>
<tr>
<td>3</td>
<td>Correct</td>
<td>Correct</td>
<td>Correct</td>
<td>Correct</td>
<td>Correct</td>
<td>Correct</td>
<td>Correct</td>
</tr>
<tr>
<td>4</td>
<td>Correct</td>
<td>Correct</td>
<td>Correct</td>
<td>Correct</td>
<td>Correct</td>
<td>Correct</td>
<td>Correct</td>
</tr>
<tr>
<td>5</td>
<td>Correct</td>
<td>Correct</td>
<td>Correct</td>
<td>Correct</td>
<td>Correct</td>
<td>Correct</td>
<td>Correct</td>
</tr>
</tbody>
</table>

In table 12 the time it took and number of clicks the participants performed during the task to order and purchase a meal from a food truck is shown. The time varies between the different participants, and so does the number of clicks. Participant 4 bought two items and participant 5 bought three items, all other participants bought one item. The same reasonable time as in Sprint 2 was used since there were no changes made during the sprint that affected the time. The reasonable time was 38 seconds and seven was the minimum number of clicks.

Table 12. Time and Number of Clicks - Sprint 3

<table>
<thead>
<tr>
<th>Test user</th>
<th>Time (in seconds)</th>
<th>Clicks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>54.8</td>
<td>7</td>
</tr>
<tr>
<td>2</td>
<td>72</td>
<td>7</td>
</tr>
<tr>
<td>3</td>
<td>113</td>
<td>7</td>
</tr>
<tr>
<td>4</td>
<td>96</td>
<td>8</td>
</tr>
<tr>
<td>5</td>
<td>74</td>
<td>9</td>
</tr>
<tr>
<td>Average</td>
<td>81.96</td>
<td>7.6</td>
</tr>
</tbody>
</table>

First Click Test - Opening Hours

When the participants were asked to find the opening hours for the food trucks they spent some extra time on the home page figuring out where to click. All of the participants found the opening hours and they thought it was clear when they got to the truck page, but some confusion arose when they started at the home page. In table 13 the result of the test is shown and participant 3 had one wrong click. Participant number 3 tried to click on the picture describing how the purchasing process works that is located on the bottom of the home page, this instead of going directly to the food truck page.

Table 13. First Click Analysis – Opening hours – Sprint 3

<table>
<thead>
<tr>
<th>Test user</th>
<th>Home page</th>
<th>Truck page</th>
<th>Successful?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Correct</td>
<td>Correct</td>
<td>Yes</td>
</tr>
<tr>
<td>2</td>
<td>Correct</td>
<td>Correct</td>
<td>Yes</td>
</tr>
<tr>
<td>3</td>
<td>Wrong</td>
<td>Correct</td>
<td>Yes</td>
</tr>
<tr>
<td>4</td>
<td>Correct</td>
<td>Correct</td>
<td>Yes</td>
</tr>
<tr>
<td>5</td>
<td>Correct</td>
<td>Correct</td>
<td>Yes</td>
</tr>
</tbody>
</table>

First Click Test – Truck Worker Page

In table 14 the result of the task “Mark an order as complete” is shown. The participants
performed the test with no visible problem or struggle. One wrong click was performed by participant 5 and this was a click on the order history button instead of directly selecting the check box for completed order.

Table 14. First Click Analysis – Mark an order as complete – Sprint 3

<table>
<thead>
<tr>
<th>Test user</th>
<th>Login – Navbar</th>
<th>Sign-in button</th>
<th>Mark order</th>
<th>Update</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Correct</td>
<td>Correct</td>
<td>Correct</td>
<td>Correct</td>
</tr>
<tr>
<td>2</td>
<td>Correct</td>
<td>Correct</td>
<td>Correct</td>
<td>Correct</td>
</tr>
<tr>
<td>3</td>
<td>Correct</td>
<td>Correct</td>
<td>Correct</td>
<td>Correct</td>
</tr>
<tr>
<td>4</td>
<td>Correct</td>
<td>Correct</td>
<td>Correct</td>
<td>Correct</td>
</tr>
<tr>
<td>5</td>
<td>Correct</td>
<td>Correct</td>
<td>Wrong</td>
<td>Correct</td>
</tr>
</tbody>
</table>

System Usability Scale

As can be seen below in table 15, the participants’ average SUS score increased from 81.5 to 88 units. Noteworthy is that test subject 3 answered ‘5’ to both question 8 and 9, which might indicate that it is an outlier in the dataset. The test subjects asked for the definition of the word ‘cumbersome’ frequently.

Table 15. System Usability Scale Test - Sprint 3

<table>
<thead>
<tr>
<th>Question</th>
<th>Test Subjects</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>Average</th>
<th>Median</th>
<th>Normalized Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I think that I would like to use this system frequently</td>
<td></td>
<td>5</td>
<td>3</td>
<td>4</td>
<td>3</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>2. I found the system unnecessarily complex</td>
<td></td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1.6</td>
<td>1.8</td>
<td>3.4</td>
</tr>
<tr>
<td>3. I thought the system was easy to use</td>
<td></td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>4.6</td>
<td>4.8</td>
<td>3.6</td>
</tr>
<tr>
<td>4. I think I would need the support of a technical person to be able to</td>
<td></td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>5. I found the various functions in this system were well integrated</td>
<td></td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>4.4</td>
<td>4.2</td>
<td>3.4</td>
</tr>
<tr>
<td>6. I thought there was too much inconsistency in this system</td>
<td></td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1.2</td>
<td>1</td>
<td>3.8</td>
</tr>
<tr>
<td>7. I would imagine that most people would learn to use this system very</td>
<td></td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>4.6</td>
<td>4.8</td>
<td>3.6</td>
</tr>
<tr>
<td>8. I found the system very cumbersome to use</td>
<td></td>
<td>1</td>
<td>1</td>
<td>5</td>
<td>1</td>
<td>1</td>
<td>1.8</td>
<td>1</td>
<td>3.2</td>
</tr>
<tr>
<td>9. I felt very confident using the system</td>
<td></td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4.2</td>
<td>4</td>
<td>3.2</td>
</tr>
<tr>
<td>10. I needed to learn a lot of things before I could get going with this</td>
<td></td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>4</td>
</tr>
</tbody>
</table>

Strongly disagree = 1; Strongly agree = 5

SUS Score 88
5 Discussion

This chapter discusses the result and the method used. Section 5.1 discusses the result, what was received from the study and how it is connected to the theory in chapter 2. Section 5.2 discusses the methods used and how they have had an impact on the obtained result.

5.1 Result

This section discusses the result and how it is connected to the theory mentioned in chapter 2. The discussion focuses on usability, navigability and ease of purchase.

5.1.1 Usability

One important aspect of usability when creating or assessing an application is to incorporate a user centered design where the user’s needs is the focus of the design [15]. This was made possible by creating a prototype in an early stage that could visualize the idea and functions of the application. It was also made possible by incorporating user testing often and early during the construction. User testing is used for systematical determination of usability and is an efficient method to assure user centered design [39]. The System Usability Scale was used to test the usability and it is an easy method that is widely adopted [40], [41]. The result of the SUS score improved during each sprint which implies that the changes that were made to the web application were beneficial for the overall usability. The final score was 88 out of 100, which can be considered as a high score. One of the questions from the SUS evaluation that received a higher average grade from sprint 1 to sprint 2 was a question concerning the integration of the implemented functionality. Between sprint 1 and 2 many functions were implemented, and they were integrated with the user in focus. The implemented functions supported the user’s core activity when using the web application and they helped to guide the user through the purchasing process. According to the ISO, a web application has high usability when the user can produce the intended result without any waste of effort and fulfill its need [16]. An integrated functionality that supports the user’s core activity supports this cause.

Two questions that received the highest mark during all sprints were two questions about learnability; how quickly the user could learn how the web application worked and how much the user needed to have learned before using the web application. Learnability is an important factor in terms of the usability of a system, both in the aspect of navigability and the user’s purchase intention [17]. The result of this study shows that a simplistic design with minimum content serves the users main use of the application in an effective, efficient and successful manner.

Another aspect of usability that was not taken under high consideration was the colors of the buttons and functions on the web application. The main color of the web application was chosen according to associations between fast food and colors, then some other colors were chosen according to their relation to the previously chosen main color. Aside from this no
other research or studies were conducted regarding colors of the web application. This might affect the user's perception of the application and the functionality on it. More carefully chosen colors could contribute to a higher overall usability.

5.1.2 Navigability

Navigability is one aspect of providing an understanding of the information on the web application. That makes navigability an important factor for the usability and for the user’s interaction with the application [1]. In chapter 2.3.2 a list of six important factors regarding navigability was presented. These factors were taken into consideration in the development of the application. A consistent design was applied on all pages where colors, fonts, sizes and layouts were coherent. Since the web application consisted of less than 100 pages a search engine was not incorporated in the design. If, in the future, the content of the application would grow, a search engine should be implemented to maintain navigability. Labels, pages and links were discussed and assessed during the construction. After the final sprint all labels were in the target groups’ primary language and all labels were clear and descriptive. The web application did not contain any drop-down menus and all menu items were fewer than seven.

A web application that is navigable on mobile devices is important for the overall navigability. Therefore, all pages of the application were designed with a responsive design that makes the mobile experience as convenient as it would be on a wider screen. The sixth and last factor in the list to provide high navigability for the user is to make the application similar to other well-known web applications, in a way to ease the user's learnability. The constructed web application had an aesthetic and design that reminds the user of other competitors’ applications.

A navigation bar was implemented on the top of each page which, according to Najjar, is important since placing navigation controls on the same place on each page provides navigation that is self-evident, self-explanatory and intuitive [10]. The navigation bar was designed according to Krug’s theories, which states that the bar should include a site ID at the top left corner, a link to the home page, a way to search, utilities and links to the main parts of the application [19]. The design of the navigation bar after the final sprint included a site ID at the top left corner, which included a link to the home page, link to utilities, such as a contact form, and a different link to main parts of the application depending if a consumer or a food truck owner was using the page.

The navigability of the web application was tested by using the First Click test [4]. In sprint 1 the test showed that a majority of the test participants clicked their first click incorrectly when searching for a food truck’s opening hours, which only gave them a 0.47 chance of overall success to complete the assigned task. This functionality was improved by increasing the visibility of the function and making the labels more descriptive. In sprint 2 none of the participants clicked their first click correctly when searching for a food truck’s opening hours. This indicates that the changes that were made between sprint 1 and sprint 2 were not optimal for improving the navigability. In the final sprint the opening hours of the truck were made visible on two separate pages and the labels were reformulated to better suit the target group. In sprint 3 all of the test participants clicked their first click right when searching for the food
trucks’ opening hours and all of the participants successfully completed the task. Even though all participants were successful with the task the process did not seem natural to the participants. They all stalled at the home page questioning where to continue. The opening hours were visible directly on the truck page but was not shown on the home page. Since all participants found the opening hours on the truck page it can be assumed that the navigability was high on the truck page but not through the whole process. This could be improved to ensure higher navigability. Overall, the required number of clicks to complete the purchasing process got higher with each sprint but the number of correct first clicks also got higher which indicates a navigable web application where users have a 0.87 chance of overall success when ordering food.

5.1.3 Ease of Purchase

There are several usability factors to consider which affect the purchase intention according to Y. Lee and K. A. Kozar. [17]. This is described in detail in chapter 2.4. In essence, an easy purchasing process is a process that supports these mentioned factors such as navigability, content relevance, and learnability. Navigability was incorporated into the design by six factors which were listed in the theory chapter 2.3.2. Content relevance and learnability was accounted for by keeping the design of the content-pages simple, and by doing so eliminate the possibility of errors made by the user. By having a big button that initiates the purchasing process, “Beställ mat här!”-button on the home page and a simple layout with buttons and information on all pages led to a straightforward purchasing process. This is believed to have influenced the learnability factor.

As mentioned in the theory chapter 2.4.1 Electronic Payments, it is also important to consider a balance between simplicity and complexity as well as credibility, confidence, and user convenience. The simplicity of the web application was incorporated by having only the most fundamental and most necessary things fronted. The other mentioned factors, credibility, confidence, and user convenience were implemented into the web application accordingly, based on user feedback and by using Stripe. Although an interesting digression to make is to examine the choice of electronic payment service providers, Stripe seemed most in line with other major payment solutions. By using Stripe, the presented payment solution had a similar look to competitors’ solutions, which might have affected the outcome of the SUS score in a positive way.

According to Serrao and Fonseca [25] the three variables to keep in mind when shaping electronic transactions and commerce is convenience, confidence, and complexity. The payment process was integrated with Stripe and designed to consider all these factors. The payment was made convenient by only requiring two inputs from the user, an e-mail address and a credit card number. This yields for a low complexity input but it is important to keep the confidence variable high by ensuring trust in the process and keeping a sufficiently high complexity.

Chapman [3] states that one way of making purchasing easy is to simplify the checkout process. From choosing which food truck and food to the order confirmation page there are as
few steps to take as possible and the checkout was incorporated with Stripe with minimal information input. By making the user not to have to log in to continue with their purchase and make a “remember me” feature available, the purchasing process became quick and uncomplicated. This makes the checkout process a smooth experience and increases the probability of the user to go through with their purchase.

By making the shopping cart summary visible at relevant pages the user is able to know what have been chosen in their shopping cart at all times. This was done accordingly to what Najjar [10] expressed and this in turn, makes for an easier purchasing process for the user. The shopping cart was available on both the menu page and the time page which allowed the user to change its mind on the time page by simply removing an item from the shopping cart or going back to the menu page to reselect food items. This was integrated with single-page application design to allow a quick browsing between the pages.

The web application’s purchasing process was also integrated as seamless as possible by addressing some important aspects and functionalities [25]. By having a familiar payment process as to other competitors, the acceptance, anonymity, efficiency, security, and trust variables were integrated into the web application.

Flexibility, integration, and reliability were also variables that was considered when constructing the web application. Flexibility in the extent that there is support for credit card and debit card however the implementation with Stripe lacks support for Swish and invoicing. The integration variable was designed with interfaces to support the web application’s intended use and purchasing process. Reliability is seen after by having a well coded payment service without points of failures.

Usability is a variable that allows the payment to be as easy as in the real world, and it is even easier when the checkbox “remember me” is filled in, making the payment process swift. The web application has been designed with scalability in mind to ease the possibility of a future expansion and thus the variable scalability has been considered. It is possible to allow a varied number of food trucks to be added to the food truck page and new costumers evidently are also allowed to use the application without entrance barriers.

5.2 Method

This section discusses the method used during all phases of the construction of the web application and how it is connected to the theory mentioned in chapter 2. The section also mentions other possible methods and aspects that could have had an impact on the result.

5.2.1 Pre-study

During the pre-study, a market survey was performed with a quantitative online questionnaire which according to Hart is a quick and cheap method of collecting data [31]. The online questionnaire made it possible to reach many respondents in a short period of time. The
questionnaire was shared in eight different groups on Facebook, all which consisted of students of Linköping University. Most of the groups consisted of students from the Industrial Engineering and Management program which can lead to the assumption that most of the respondents of the survey belong to this program. Students of Linköping University is the target group of this web application and since 99.3% of the respondents of the survey said they were students of Linköping University the result of the market survey should be in line with the target group. However, since most of the respondents presumably belong to only one program, and therefore is a homogenic group, this might have had an effect on the result. According to I. D. Cooper and T. P. Johnson, aside from regarding the participants of the questionnaire and the limitations of the survey, it is important to regard the clarity of the questions asked [32]. The questionnaire consisted of eight multiple choice questions where the formulations of the questions and the order of the questions were carefully chosen. A different order of the questions or different formulations could have impacted the result. The use of open end questions could also have resulted in more answers and ideas for the project, but it would also have impacted the time and work load of the pre-study.

Several prototypes were constructed during the pre-study. These were constructed to receive valuable insight in an early stage in the project, as stated by the Nielson Norman Group [34]. The different prototypes were assessed and discussed according to their potential to meet the criteria for a web application with high usability with regards to navigability and ease of purchase. A combination of these prototypes was used as a foundation to the project. The use of multiple prototypes made it possible to incorporate many ideas and different views, however it also made the process of creating a cohesive design more difficult. The prototypes were all based on the functionality that was wanted of the application. The Pin Card process described by VanGundy was used to brainstorm functions that was appropriate for the application [35]. In VanGundy’s method the process is supposed to last for 20 to 30 minutes but adjustments were made so that the process could go on until all 192 ideas were put in paper. This adjustment reduced the level of stress connected to the process. The process made it possible to extract many ideas in an uncritical environment. The following categorization and organization made the necessary, desired and unnecessary functionalities clear in a structured manner.

5.2.2 Implementation

The discussion of the implementation is focused on the usage of Ajax, the choice of having a single-page application structure, as well as the programming languages that were used.

One of the main downsides of using Ajax’s load function for server calls was that it was tedious to implement the handling of the storage of variables and states for data intended to be persistent from one web page to the next. During sprint 1 and partly in sprint 2, the entire web server used single page architecture, which produced some unintended results such as the inability to return to previous web pages, as mentioned in section 4.2.4 regarding the back-end. Granted, the single-page application structure worked well for handling the shopping cart, the menu and time pages as well as the Stripe modal, it became evident that the rest of
the application was more conveniently designed as a regular page, due to separation of concerns and having more work done in the client side, i.e. in the web browser.

It was also time consuming for each member to have to learn a multitude of languages such as Python in the back-end and JavaScript in the front-end. However, getting into the details of the languages allowed customizations that were closer to the target audience’s needs.

5.2.3 Evaluation
User tests were performed to evaluate the usability of the web application with regards to navigability and an easy purchasing process. The user test performed were simple, efficient, and based on well-established theories. These tests can therefore easily be replicated.

When to Perform User Test
User tests were performed in sprint 1, 2, and 3, which made it possible to see the progression over time when it comes to usability. The System Usability Scale was performed in the same way each sprint and the scores can therefore be compared. The other tests changed from one sprint to another since the structure of the web application changed. Therefore, it is not possible to compare those results as if the tests were the same. Despite this, it was valuable to perform tests in each of the sprints to get general input from the test participants.

User tests were not performed during sprint 0 since the web application was not implemented yet. However, it would have been possible to do user testing on the prototypes that were created in sprint 0. This could have revealed issues with the design before even implementing it and consequently have saved time. It would not have been possible to do the same user tests as performed during the other sprints and it would have been necessary to find a test suitable for the prototypes.

System Usability Scale
In contrast to the two other tests, the System Usability Scale is well-researched and widely used for all kinds of web applications [40]. The test was performed without modifications which results in high validity. However, the questionnaire was given in English and all the test users' native language was Swedish. This could have impacted the result if the test participants did not understand all the statements or interpreted them differently. One way to avoid this problem would have been to translate the questionnaire into Swedish, or to have chosen a different test already in Swedish. The SUS is a general questionnaire that measures the usability of a web application. This means that it regards all aspects of usability and present a summarized score. Not all aspects of usability were taken under consideration during the study and it is difficult to tell through the SUS which factors had the greatest impact. The SUS did however show a higher score for each sprint which could imply that a focus on navigability and ease of purchase results in high usability.

During sprint 2 and 3 the test participants were given one more task to perform than in sprint 1, this could have affected the SUS score. In example, the test result for “I found the system
was very cumbersome to use.” was lower in sprint 2 than in sprint 1. The new test could be the reason why the participants found the application more cumbersome to use.

**First Click Analysis**
The First Click Analysis was not performed in the way described by Bailey et al. [4]. Instead of only looking at the first click when the test users were given a task, all clicks were analyzed. This way it was possible to do several First Click Analyzes. This modification of the method could have impacted the test result and therefore it is not certain that this is a good way to measure navigability. This could in turn impact the validity of the test results. The other way to do it would have been to analyze the first click in one test, and then do another test starting from the next page and analyze the first click there. However, this would have impacted the results of the second test since the test user would have prior knowledge of the application and therefore know where to click. This was still an issue since the test users were given two tasks. In the first sprint, all five test users were first given the task to order a course, and then given the task to find the opening hours. This could have impacted the result of the second test since the tests users were already familiar with the application when trying to find the opening hours. In the following sprints this risk was reduced by letting one part of the test group do the tasks in the reversed order.

**Measuring Time and Clicks**
Time and clicks were measured to evaluate the purchasing process, but these results were not very useful for further development. Even though a high number of clicks or a long time could indicate that the purchasing process was too complicated, the results do not show what part of the purchasing process that should be redesigned. It was more valuable to watch the test participant perform the task to see where they spent longer time than expected. Furthermore, the measured time and number of clicks cannot be compared from one sprint to another since new functionality was implemented. A reasonable time of completing a purchase was calculated for each sprint. This time was compared to the measured times of the test participants. The result of this was that the majority of the participants completed a purchase a lot slower than the calculated reasonable time. This could be interpreted as that the navigability of the application was poor but through observations of the tests, it was noticed that almost the only difference between a fast and a slow participant was the time it took to choose what course to order. Thus, the results from the time test was not really accurate. A small modification of the tests, such as telling the participants which course they should order could have made the test more useful in the final report.

This method of measuring the ease of purchase can be questioned. It can be disputed whether the reasonable time measured by the developers is a good reference, since the developers are aware of the web application's structure beforehand. It would have increased the validity if a reference supported by previous studies could be found of how long time it should take to complete a purchasing process.
**Test Participants**
The test participants were all students at the institute of technology, but the target group includes students from all different faculties. Among these 15 students, 13 were students from the Industrial Engineering and Management program. In what way this could have impacted the test results is hard to determine. According to Krug, the test participants should reflect the target group, but it does not have major impact on the test result [19]. This come in use if a replication of this method is performed. However, having a more varied test group could still have increased the validity of the test results.

Each test was performed with five test participants, and according to J. Nielsen and T. K. Landauer these tests will only have discovered 85% of the usability problems. To discover all problems, the test could have been performed with more than 15 participants [45]. The tests were performed with five participants because it was more time efficient to perform the tests with less participants. To get the maximum value when considering both cost and benefit, the tests could have been performed with four participants [45], and this would have been even more time efficient. However, in this study, cost was not taken into consideration and therefore five participants were used to increase the benefit of the tests.

5.2.4 **Source Criticism**
The main focus of the source selection process was to find and use academic sources as these are all reviewed by independent researchers before being published. The majority of the sources used are such papers. However, some complementary sources are used in order to bring light on several subjects. Some of these complementary sources are blog posts [21], [42] and [43]. These have been added as the field of study lack newly published materials because of the industry that is constantly moving forward. However, these posts have been chosen with great caution. Both the authors and the posts have been vetted to assure reliability. Books covering widely accepted methods in readability [19] have also been used in order to widen the knowledge base. Additionally, some studies can be classified as old but as these studies are fundamental in the field of readability and basic definitions they can still be considered as highly relevant.

Information regarding implementation- and development methods have in general been collected from companies, writers or similar organizations and not from academic literature. The main reason to this is the lack of updated academic sources in this field and that there is a consensus that these companies are in the forefront of technology. However, an additional vetting of these sources could be considered as necessary.

5.3 **The Work in a Wider Context**
During the project, research about usability on a web application has been done. This was followed by a construction of a web application that has high usability, regarding good navigability and an easy purchasing process. However, that does not guarantee that it is usable for the intended user. One major aspect to consider for the future work on this application is
the involvement of the food trucks owners. The food truck owners must be willing to be part of this solution and they need to see the benefits that it offers. Without contributions from the food trucks, the application would not deliver any value to the consumers that it was aimed to. With less support than expected from the food trucks, the application could work as an informational service to the consumers about the menus and the opening hours of the trucks present at Linköping University. With full support and collaboration, the web application can be used as it is designed at this stage. To aid the food trucks with this collaboration it would be beneficial if a similar study would be performed with focus on the food trucks usability when using the application.

One ethical dilemma that this web application faces is that it would inform about and sell other companies products. To regulate the shared responsibility an agreement would need to be formed between the owners of the web application and the owners of the food trucks. This responsibility agreement also needs to be clear and visible to the consumers and the customers of the application. If a problem with an order occurs, a pickup of an order or the content of an order it needs to be clear to the consumer where to turn. The web application has a contact form where customers can get in contact with the owners of the web application but otherwise the information on the web application is sparse.

This web application is set out to help the student gather information about the food trucks and reduce the time the students queue to obtain their lunch. According to the market survey performed in the pre-study, see Appendix A, a majority of the respondents would buy lunch from the food trucks if the queue was reduced. This web application sets out to reduce the queues, but it cannot guarantee shorter lines. The queues at the food trucks point of sale might be reduced but eventually the queues at the pickup station could get longer. If it is not possible for the food truck to have two separate stations predication of the queues is hard to perform. One aspect that the web application can aid the food trucks with is that pre-ordering can spread the distribution of orders during the day. This will both reduce the queues for the consumers and help the food trucks receive a more even workload.
6 Conclusion

The aim with this chapter is to present conclusions drawn from working with the web application.

To create a navigable application several measures have been taken. The web application has a consistent design and it has been made mobile compatible to increase navigability. Additionally, it contained a self-explanatory, intuitive navigation bar containing fewer than seven menu items and no drop-down menus which has a positive impact on navigation [21]–[23]. To ensure an easy purchasing process several functionalities were put into place. The shopping cart was always visible to the user to lower confusion during the purchasing process. Furthermore, the payment was made convenient by only requiring two inputs from the user.

This report shows that a web application specially constructed to comply with the needs of a specific target group can be created with the help of user feedback during the development process. However, the tests that were performed could have included a wider spectrum of participants and theory on evaluating completion times of tests to further increase the validity. Nevertheless, one can conclude that through observations of continuous user tests, performed in realistic conditions, a web application can be constructed with high usability, regarding good navigability and an easy purchasing process.

A launch of the web application could potentially provide the target group with a product that makes the lunch experience more convenient by offering an easy purchasing process with high navigability. Something that would be interesting for future studies would be to involve food truck owners in the testing process to add an additional perspective. An English version of the website could be developed to increase accessibility.
References


X. Liu, J. Heo, and L. Sha, “Modeling 3-Tiered Web Applications.”


Appendix
Appendix A – Market Survey

This appendix contains the Market Survey conducted for the project and the results of this mentioned study.

**Vad skulle få dig att köpa lunch oftare från en foodtruck på Blå havet? (Välj max tre alternativer)**

<table>
<thead>
<tr>
<th>Option</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Att kunna se vilka...</td>
<td>83</td>
<td>53.5%</td>
</tr>
<tr>
<td>Möjlighet till att...</td>
<td>66</td>
<td>42.6%</td>
</tr>
<tr>
<td>Körlare köld</td>
<td>88</td>
<td>56.8%</td>
</tr>
<tr>
<td>Latillare att hitta...</td>
<td>10</td>
<td>6.5%</td>
</tr>
<tr>
<td>Latillare att göra...</td>
<td>4</td>
<td>2.6%</td>
</tr>
<tr>
<td>Billigare pris</td>
<td>120</td>
<td>77.4%</td>
</tr>
<tr>
<td>Att kunna förbok...</td>
<td>22</td>
<td>14.2%</td>
</tr>
<tr>
<td>Möjlighet till att...</td>
<td>35</td>
<td>22.6%</td>
</tr>
</tbody>
</table>

135 responses

**Rangordna vad du äter till lunch oftast (1=oftast, 3=det du äter minst)**
Hur ofta äter du lunch från någon foodtruck?
152 svar

- 59,2%
- 30,0%
- 8,6%

När bestämmer du dig för att äta lunch från foodtrucksen?
152 svar

- Dagen innan
- 24,3%
- 42,1%
- 13,2%
- 20,4%
- 13,6%

Skulle du vara intresserad av en onlinetjänst där det finns möjlighet att beställa mat från någon foodtruck i förväg?
152 svar

- Ja
- Nej
- 59,9%
- 40,1%
Torr du att en onlinetjänst skulle öka din konsumtion av mat från foodtrucksen?
155 svar

År du student på LIU?
152 svar

Vad är din ålder?
152 svar
# Appendix B – System Usability Scale

**System Usability Scale**


<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly disagree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I think that I would like to use this system frequently</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>2. I found the system unnecessarily complex</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. I thought the system was easy to use</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. I think that I would need the support of a technical person to be able to use this system</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. I found the various functions in this system were well integrated</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. I thought there was too much inconsistency in this system</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. I would imagine that most people would learn to use this system very quickly</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. I found the system very cumbersome to use</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. I felt very confident using the system</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. I needed to learn a lot of things before I could get going with this system</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix C - Marketing Plan

This appendix contains a marketing plan created for the LunchHero project in order to evaluate risk and strategy going forward.

Introduction

LunchHero is a startup that will launch a new service for its future clients at Linköping University. The idea is to serve the consumers at the food market of Blå Havet (a square situated right in the heart of the campus area) with more flexibility and more time efficient lunch breaks. These remarks will be addressed by making a web application which will bring the freedom of choice closer to all consumers. The current situation forces the consumers to choose food trucks with shorter queues because of their lack of time during the lunch breaks. Without any sign-up process this service should be easy to use even for new clients and everyone should be able to order food in advance and choose at what time they want to pick up their order.

The main goal for LunchHero will always be to maintain the simplicity in the web application even though the development hopefully will continue beyond the release date. A web application with easy navigation is essential to keep and gain new users among the students that are known to be sensitive to trends.

With the aim of connecting all food trucks to the web application, LunchHero will be the future platform between clients and food truck owners. Incentives for the merchants will mostly consist of easier planning of raw material consumption as well as staff planning, less struggle during the lunch rush and possibility to promote offers in the web application. "It is all about timing", is a well-known expression when it comes to startups and the launch of new businesses. Considering this the launch of this web application is ideal. The food trucks at Blå Havet are open for the second year and therefore the concept can be regarded as well-established and the consumers know what to expect [1]. This happens at the same time as 90% of the Swedish Internet users during 2017 commonly used internet to compare prices before a purchase and 70% of them have bought something online that they later picked up at a physical store [2]. According to the Swedish Digital Commerce association the Swedish online food retailing reached a growth of 30% during the first quarter of 2018. At present the trend is increasing, and the business is unexploited since only 2% of the total food retailing is done online [3]. In other words, it is the ideal time to introduce LunchHero.
PEST analysis

There are two versions of PEST analysis, where PEST is the most common. The other one, a PESTEL analysis, is an expanded version which adds also legal and environment to the original four subjects of discussion. Since legal and environmental factors are not likely to give any big impact on LunchHero's business, a PEST analysis was chosen.

Political factors

The political factors that could impact on LunchHero's business are not seen as many due to the political system in Sweden. The democracy in Sweden is well developed and decisions in the Swedish parliament is proceeded by a submission for comment where interest groups can express their opinion regarding the proposal [4]. The only political risk seen in LunchHero's business is a potential raise of taxes as VAT for example. Possible changes in the payroll tax for young employees that would have impact on the restaurant business will not include LunchHero since the recruitment rate is low [5]. Another factor to observe is any changes by the government regarding the study loan. There would be an impact on sales assuming that a majority of LunchHero's clients had a higher or lower spending income. Still, any of the factors mentioned above are not expected in the near future and because of that the risks are low.

Economic factors

Economic factors, in a macro perspective, are synchronized with the overall business cycle and the government finances. Of course, this will have an impact on LunchHero in the long run, but it is hard to see any close connection in the short term. In the long term, a flourishing economy gives higher appropriations to the university which leads to increased employment as well as more students. In short, more potential clients for LunchHero. Naturally the opposite scenario leads to less sales for LunchHero. The risks would be more significant if the clients worked in the private sector but due to the local segment at Linköping University, LunchHero is quite spared of major fluctuations in economic activity. This gives a low risk of impact on LunchHero's business.

Social factors

The social factors could be one of the biggest risks or opportunities for LunchHero. Since students tend to eat together and meet a lot of other students during the day it is important for LunchHero to create massive publicity and make sure that consumers speak in good terms about LunchHero. Otherwise there is a risk that potential clients will not even try the service based on friends’ experiences. Another social factor that could affect is the attitude towards buying lunch, instead of bringing a lunch box. It is hard to know if students have any distinct opinions about this, but the Swedish society in general has become more service friendly and the tax deduction for services, in Sweden called ROT and RUT, has played a general role in
that evolution [6][7]. Regarding that movement, which also has been pushed by a society where more and more people feel stressed, it is expected that even more students could think of buying lunch. Something else that could endanger the business of LunchHero would be a major scandal in the form of some sanitary or quality issues at the food trucks. This is something that LunchHero will not be in charge of but of course something that will affect the sales revenues if no one wants to eat from the food trucks. With these factors in mind, the social risks are regarded as quite high compared to other risks.

**Technological factors**

The technological factors are several since LunchHero is a tech startup that will launch an online food ordering service. The technological solution might not be appreciated by the clients, and they might not be satisfied with the design etcetera. But in this section the focus is on the macro technological factors which includes internet access and development of online businesses within e-commerce. It is grateful to launch a web application at a university since internet access is good and students tend to be adaptable to new innovations. The technological innovation in Sweden is good compared to other countries and younger students who will start their university studies will have grown up with e-commerce.
NABC analysis

Need

Today most of the students at Linköping University bring their own lunch to school, according to a study we have performed. However, there is a need for an alternative that is cheap, fast and convenient when homemade food is not an option or when the desire to try something different strikes. Every day at Blå Havet there are different food trucks offering their services to the students. Between 12:00 and 13:00 the lines grow long, and the waiting time can be up to 30 minutes. Our study shows that about 57% of students think that the queuing is a reason for not eating lunch from the food trucks more often. Also, 43% of the students find that not being able to see the menu anywhere other than on the truck is an obstacle. This takes time and joy away from the students well-deserved lunch break. A time that is supposed to be stress-free and used for recovery. The study also shows that 77% of the students think that a cheaper price would increase their consumption.

Approach

To meet this need we are going to build a platform to make the process of buying lunch more convenient. This platform will gather the information and daily menus for all the food trucks and make it possible for the customer to place their order from anywhere online. A web application that makes it easy to navigate through different offers and pre-order lunch. We want to help the truck owners with the problem of most orders coming in at the same time and the uncertainty of the quantity of orders. This application is supposed to work on both laptops and cell phones, making it easy to use every day.

Benefit

The perks of using this application are many. Having a designated place to find information about menus and offers from the food trucks will help students make daily decisions about their lunch. It can help the students to find meals of their liking and make it easier to try something new. Being able to pre-order food will make it possible to avoid long lines at lunchtime and pick up the food as soon as it is ready. This will benefit the food trucks that can plan and organize their work as well as the consumers who will have more time enjoying their lunch. The possibility of planning ahead could lead to an easier and cheaper process for the food trucks. We believe that this will lead to less stress and more available offers for both the food trucks and the consumers.

Competition

There is currently no available web application to meet the aforementioned need at Linköping University. The biggest competition we see for our application is the physical transaction that
the students already know and use. That is why the market entry is important for LunchHero and we believe it is of great importance to create a hype to win the first costumers who then can act like ambassadors and spread the word about LunchHero. This could only be done if the consumers find out that our service is more convenient than to buy lunch the traditional way outside. Another major obstacle, which is closely connected to the previous one, is how to overcome the resistance to change behavior, both with regard to the consumer and the vendors. This should be done by a professional behavior in a way that LunchHero always is regarded as a professional company with a long-term focus. Because, it is important that the consumers do not think about LunchHero as a short-term solution that might disappear.

Other services are established in different cities in Sweden, but the major competitor of those solutions is the German company Delivery Hero. With Onlinepizza and Foodora in its portfolio, this is the greatest actor on the Swedish take-away food market [8][9]. Since only Onlinepizza is established in Linköping, so far, we believe the two of us can exist on the market at the same time. Onlinepizza offering mostly pizzas and they also include doorstep delivery service in their prices. This is a great service for some customers, but it is also associated with frustration when the driver does not find the delivery address and the delivery takes longer time than expected. We believe that the local market on Campus Valla want to have fresh food, less frustration and the great variety of different lunches which is offered by the food trucks at Blå Havet.

**Conclusion**

We see opportunities and possibilities for this solution. With low competition on the market and with a target group that is used to picking up new traits there is room for our solution to prosper.
SWOT analysis

A SWOT analysis shows the company's strengths and weaknesses while also considering possibilities and threats.

Table 1. SWOT-table with Strengths, Opportunities, Weaknesses and Threats.

<table>
<thead>
<tr>
<th>Strengths</th>
<th>Opportunities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low startup/maintenance cost</td>
<td>Students tend to embrace new applications</td>
</tr>
<tr>
<td>Diverse and agile team</td>
<td>Internet shopping is growing</td>
</tr>
<tr>
<td>Strong knowledge of the local market</td>
<td>First service of its kind at Campus Valla</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Weaknesses</td>
<td>Threats</td>
</tr>
<tr>
<td>Completely new on the market</td>
<td>Food trucks not being interested in participating</td>
</tr>
<tr>
<td>No experience in the field</td>
<td>Similar applications which can easily integrate this function</td>
</tr>
<tr>
<td>No funding</td>
<td>Customers rather buying face to face</td>
</tr>
</tbody>
</table>

Strengths

LunchHero's goal is to supply a user-friendly web application where users can pre order food from a food truck online on multiple platforms and pick up at a desired time. There is a clear advantage for LunchHero as the current team studies at the university and has vast experience from the current market. This gives LunchHero a brilliant opportunity to be attentive and make essential changes in the concept to attract the consumers.

The costs for the project are going to be kept low as the only costs revolve around the web application. This is due to the fact that the company is only the middle man in these transactions. Additionally, the compatibility is high as the aim is to provide a responsive web application making it compatible with all smart phone and desktop devices. Marketing which is a fairly high cost for many companies will not be considerable for LunchHero since the market is geographically small and spread of the word physically and in social media is supposed to be the main marketing strategy.

Weaknesses

The company is completely new and thus has no earlier reputation or large amounts of capital. This makes the launching of the web application more difficult as there is no money to be spent on big advertising campaigns. Instead of big campaigns cheaper options are going to be necessary such as social media advertisement or simple methods such as recommendations from reference costumers. These are potential problems that could have negative impact on user growth.
Opportunities

Students in general tend to embrace new technologies or applications that can save them time or money. LunchHero’s web application falls into these categories and this could probably benefit the user growth of the application. Since the concept is completely new it could also be a benefit that users want to try something new and influencers tend to attract hang arounds and followers which give LunchHero an opportunity to enlarge the customer base. The Swedish ecommerce for 2016 was approximately 8,5 billion euros [10]. The number of transactions made with mobile phones tend to raise, which gives LunchHero an advantage as well [11]. To buy lunch is an everyday consumption which is identified by the regularity and short time of consideration before the purchase. Everyday consumption suits well for mobile platforms that are easy to reach during all day.

Threats

A major threat to the web application would be that none of the food trucks would be interested in partaking in the project. Maybe they will not be able to see the opportunities and rather focus on themselves having to adapt to the web application. This problem could also be translated to a normal customer. If the customer chooses to stand in line in order to buy food directly from the food truck this would also be a potential threat. Maybe they are not inclined to trust a third party, or they might want to be able to change their decision last minute. Furthermore, an active competitor with an already existing application could easily copy the idea and thus create a strong competitor.
Marketing strategy and goals

The main goal of marketing is to increase the user base of the web application within the Swedish market. In addition, the web application also emphasizes the possibility to save time while eating a good mix of diverse and healthy food. According to Porter, there are 3 different strategies to increase market shares, leading to a competitive advantage compared to competitors [12]. These areas are cost-leadership, differentiation and focus. The service provided by LunchHero will have a focus strategy where the main goal is to target one segment at a time offering a unique service which enables customers to save time. Differentiation is also one of the strategies as this service is something new and non-existing in the current local market. The main strategy does not involve a low-price strategy but rather a time saving one where customers easily can order food and pick it up at a more convenient time.

LunchHero's main goal is as mentioned before to increase the user base of the web application within Sweden. However, the goal is also to achieve a certain status within the target segment through social media marketing. Therefore, LunchHero's first measurable goal is to take part in 1000 transactions within 6 months of launching. As this is a measurable goal, progression can be seen throughout the process and would enable cross-referencing with the ongoing marketing efforts.
STP analysis

The aim of this analysis is to describe the ideal clients for LunchHero's business and describe how LunchHero should package the offer to its clients. This is done below in three different parts called Segmentation, Targeting, and Positioning.

Segmentation

The demographic segmentation is quite clear since LunchHero will penetrate a local market at Campus Valla, which leads to a small segment of customers. At Campus Valla, we identify two groups of customers, students and employees. The market survey showed that over 95 % of the participants were students at Linköping University in the ages between 20-25.

- The smaller group of potential clients is employees at Linköping University. Since the campus is not located that close to the city of Linköping and areas where employees are assumed to live, the majority of this group will have to bring a lunch box or buy lunch at the campus. This group has a higher income, which probably gives them the possibility to spend more money. The distribution of ages in this group is hard to estimate, but they are at least between 25-65 years old. They are more independent in their choices than students.

- Students is the major segment at Campus Valla. As many as 90 % of the responders in the market survey said that they buy lunch at the food market less often than twice a month. According to the same survey the main reasons to their rare visits at the food trucks are that it is too expensive and because of the long queue times. This group usually solve these problems by bringing a lunch box instead of buying lunch at the campus. In this group peer pressure exist which in this context means that this group follows each other, and they want to eat their lunch together since they don't have any office desk to return to.

  - A subgroup within the students is the group of students that have a tight schedule and needs to eat quick. These students want the possibility to order in advance and they want a service experience where their meal is ready just in time when they arrive to pick it up.

  - Another subgroup is students with a tight budget. These students want to have their meal as cheap as possible. They most often bring lunch boxes for lunch which they usually cook in large scale to save time and money. But still there are days, even for them, when different reasons make it impossible to bring lunch. Those days they want a service and could even order the day before if they get any discount or benefit.
**Targeting**

The target group for LunchHero is clearly the students since that group together creates the greatest purchasing power because of their quantity. This group could still be divided into two subgroups where one group experiences lack of time during their lunch break because of meetings and other commitments. For this group, the web application will be used as a time saver and therefore it is important that the entire web application is easy to use, fast and responsive, as they put high demands on the entire supply chain, from order to deliver. The other subgroup tends to value money higher than time. There is a great chance this group would decide and purchase the day before if LunchHero could offer them a lower price. Consequently, they lose their flexibility, but they can afford to buy lunch through LunchHero more often.

The employees at campus also compose a target group, but they are harder to track since the group is heterogeneous. They have a higher discretionary income, but they are a minority relative to the students. The expectation is also that this group is less willing to change their purchasing habits and adapt to a new web application. Therefore, this group is not a primary target group.

**Positioning**

Good positioning relies on four segments; clarity, credibility, consistency, and competitiveness. Clarity means that the target groups need to understand the value of using LunchHero instead of buying directly from the food trucks. This should be done by giving the first clients a great experience. Credibility is important since it will lead to recommendations and that LunchHero's clients want to spread the word about the web application. Therefore, every client needs to experience a smooth purchase. Another way to inspire credibility is to show the food trucks that LunchHero generates new clients to their businesses and visualize that the biggest impact comes through collaboration. Consistency should be achieved by showing new clients that the service meets their expectations after a recommendation. LunchHero's competitiveness will consist of meeting every client's need. Therefore, the competitiveness relies on good offers for the clients and continuous development of the application.
Marketing mix

Students in general tend to embrace new technologies or applications that can save them time or money. LunchHero’s web application falls into these categories and this could probably benefit the user growth of the application. The Swedish e-commerce for 2016 was approximately 8.5 billion euros [10].

Product
LunchHero's approach to the product is to offer a less time-consuming way to order lunch from food trucks, as people’s stress levels are going up [13]. LunchHero offers people the opportunity to swiftly pick up their lunch without having to spend time waiting, so they have more time to do the things they have or want to do.

The product is a web application that connects the clients with the food truck without having to go there, look at the menu, order and wait some more. The web application makes it possible to calmly and easily order food from the food truck and chose a convenient time for pickup. By following some easy steps, the customer can order their food from a nearby food truck, pay in the application and then receive a time when they can go pick it up. This way the customer can avoid wasting time standing in queues outside and instead order easily from a suitable place. Saving the customer both time and improving convenience. With this feature, LunchHero differentiates itself from the "normal" food truck as it provides an opportunity to save time while buying food in a convenient way.

The web application is designed to make it as easy as possible to order and pay for the food. It provides the customer with a swift way of shifting between food trucks to decide what or where they want to eat. The customer can then easily choose they want and pay via their credit card and in the near future also “Klarna” to speed up the process. After these easy steps the customer can chose when they want to pick up their food.

Place
The service focus market at launch is going to be Linköping and more precisely Campus Valla at Linköping University. The first connected food truck will therefore be located at this establishment. As this service is a web service the application will be accessible at all times and the customer can order from anywhere. The main channel of distribution of our service is therefore through our website.

Price
The price strategy of LunchHero revolves around taking a certain percent of the end price for every meal. The price will be based on a model of revenue and transactions sizes where the goal is to have the lowest percentage at 5%. The payment process will be located in the application and the aim is to in the long run implement a credit service like "Klarna" to speed
up the process even more. However, the main goal is to be able to save time for our customers, so they will be able to do other more important things than to stand in line.

**Promotion**
The LunchHero marketing effort will mainly be based on social media platforms while also focusing a lot on customer interaction. Additionally, the marketing is focused towards customer loyalty. Customer loyalty involves focusing on several fields where two of them are reliability and assurance [14]. By providing a clear communication path towards customers and assuring them a swift delivery from the food trucks LunchHero will be able to improve customer loyalty and reach a higher profit. To improve customer engagement, LunchHero will focus on social media marketing - something that will provide the customer with a clear way of communicating with LunchHero, thus increasing customer interaction [15].

The social media marketing will try and get so called “promoters” to join the campaign. A promoter is someone who is in exchange for something promotes the product through social media and his or her friends. The best case would be to get someone famous mention the application via a blog or any other social media. Through this effort LunchHero would be able to reach a wider spectrum of customers via at least two channels (internet and mouth to mouth recommendations) for a reasonable price.

LunchHero will also try and involve the University in this project. A good relationship with the university could lead to exposure on their Facebook page or Instagram something that reaches a majority of students, the main customer. Likewise, this could attract local media and thus increase the awareness of the LunchHero application.

Furthermore, LunchHero will engage in local marketing efforts in the beginning of the launch. This will include posters, flyers and general conversations with people all over Linköping University in order to promote the product and increase the user base.
References

Appendix D – Prototypes

This appendix contains all prototypes which were created in order to get an idea of the final application.

Figure 1. Prototype 1 – Home page

Figure 2. Prototype 2 – Menu page
Figure 3. Prototype 3 – Menu page

Figure 4. Prototype 4 – Purchasing flow page 1
**LunchHero**

**VÄLJ FOODTRUCK**

På campus just nu

Övriga

Välj foodtruck  Välj mat  Välj hämttid  Betala

---

**LunchHero**

**VÄLJ MAT**

Korv 60 kr  Mos 79 kr

Välj foodtruck  Välj mat  Välj hämttid  Betala

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*Figure 5. Prototype 4 – Purchasing flow page 2*

*Figure 6. Prototype 4 – Purchasing flow page 3*
Figure 7. Prototype 4 – Purchasing flow page 4

Figure 8. Prototype 4 – Purchasing flow
Appendix E – List of Flask Plugins

<table>
<thead>
<tr>
<th>Plugins</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flask</td>
<td>A framework to build a web application with python</td>
</tr>
<tr>
<td>Flask-Login</td>
<td>Helps with the management of user session in a Flask application</td>
</tr>
<tr>
<td>Flask-SQLAlchemy</td>
<td>A tool to integrate an SQL database with the flask server</td>
</tr>
<tr>
<td>Flask-Basicauth</td>
<td>Enables a password protection to be applied on parts of the web application</td>
</tr>
<tr>
<td>Flask-WTF</td>
<td>Makes the management forms and validation of them easier</td>
</tr>
<tr>
<td>Flask-Login</td>
<td>Manages the user sessions for Flask including logging in and logging out</td>
</tr>
<tr>
<td>Werkzeug</td>
<td>Includes basic functions for Flask</td>
</tr>
<tr>
<td>Flask-Session</td>
<td>Helps the management of user sessions</td>
</tr>
</tbody>
</table>