Nokia Arena Event Application — A Case Study of Nokia Corporation

Vertti Airaksinen, Marko Hyrri, Rasmus Kannisto, Vesa Nieminen

2022 Laurea

Laurea University of Applied Sciences

Nokia Arena Event Application — A Case Study of Nokia Corporation

Vertti Airaksinen
Marko Hyrri
Rasmus Kannisto
Vesa Nieminen
Business Information Technology,
Tietojenkäsittely
Thesis
November, 2022

Laurea University of Applied Sciences **Abstract**
Business Information Technology, Tietojenkäsittely
Bachelor's Degree

Vertti Airaksinen, Marko Hyrri, Rasmus Kannisto, Vesa Nieminen
Nokia Arena Event Application — A Case Study of Nokia Corporation
Year 2022 Number of pages 38

The intention of this thesis was to create a mobile application prototype for Nokia Corporation to use during events in the Nokia Arena. Major features are food and merchandise delivery and a navigation system inside the Nokia Arena. The goal of the application is to add value for event goers, while taking into consideration accessibility and to create a new platform for Nokia to highlight the latest emerging wireless technologies.

The functional part of the thesis was created with the Design Sprint method. Major functions and design choices of the prototype were based on our data gathering from potential users, as well as comparison of existing products in adjacent fields. Data gathering questionnaire focused on the reasons behind people downloading and using event specific applications, and the interview on what a user would value the most in an event application.

The prototype helped to visually show the features of the application in the interview and in the pitching event with Nokia representatives and gather insight and comments from the interviewee for the direction further development might pursue. The prototype was also well received by customer's representatives at the end of the week long Design Sprint.

Based on the research and prototyping done, there is potential for end users, but hesitancy to adopt any products that do not offer tangible benefits is great. Therefore future products must go through rigorous user experience development process in every step of the way to ensure success, and must have enough backing of business partners that can offer those benefits to the end users.

Keywords: Nokia, 5G, Mobile, Prototype, Event

Contents

1 Introduction

This thesis is based on the requirements set by Nokia Corporation for innovating next generation experiences at the Nokia Arena. The research problem is how to create a service concept which can improve the stadium experience, while at the same time making the Arena more attractive for potential business partnerships. As adequate accessibility is a crucial aspect for a segment of Nokia Arena event visitors (Lahtinen 2021), it gave a reason to have it an important consideration for this thesis. Thus, it was decided to answer the question of how we might improve the Nokia Arena going experience using a mobile application, while taking accessibility into account?

As was found out through research, this can be achieved in large part by new and improved current or future network technologies. Based on the requirements and after consulting with Nokia representatives, it was decided that this concept design is a mobile application prototype for enhanced shopping experience which considers customers with disabilities or other mobility difficulties at every stage of the process. The application utilizes 5G network features for improving crowd management via location service, real time AR navigation via edge computing and product delivery service from on-location vendors.

This functional thesis project is based on the Design Sprint method developed for Google Ventures. The actual functional ideation, creating the prototype and presentation of finished concept to representatives of Nokia Corporation were all done in one week. Further research data was gathered with an interview of a frequent event visitor at the Nokia Arena, and with a questionnaire that gauged the previous and potential future usage and interest for any mobile application meant to enhance the event experience.

The finished concept is synthetized from several ideas that the team had and took the form of the event application on the first day of the Design Sprint. The focus of the application is to improve shopping experience, especially for people with mobility difficulties. Service Design principles were used to set the key feature to be high accessibility, and we decided early on to get an interview from a person who would fit the customer profile.

Main parts of this report are introduction to the case study and the Design Sprint method, followed by explanation of the core concepts and the knowledge base behind the design concept. Next chapters detail the background, our data gathering methodology and finally before conclusion the prototype is detailed.

2 A Case Study of Nokia Corporation

Nokia is a company founded in 1865, which was later changed to use the name Nokia Ab in 1871, and at the same time the corporate form changed to a limited company. Nokia Ab originally operated as a wood grinder, but due to the estimated increase in demand for pulp, it was converted to a paper mill. After this, Nokia Ab went through many phases, because in the 1960s Nokia was already a multi-sector company operating in the rubber, cable, forest, electronics, and power generation industries. From the 1980s, Nokia began to renew its strategy, focusing on telecommunications equipment, and sold its operations focused on other businesses. (Pörssitieto 2022.)

In the 2000s, Nokia merged its network infrastructure operations with Siemens to form the joint venture Nokia Siemens Networks. Nokia bought Siemens' stake in Nokia Siemens Networks in 2013. Today, Nokian operates at the center of network solutions, where people, machines and devices are brought together for real-time interaction. Briefly, the strategy is to deliver critical network technology with the help of technological leading and trusted partners. Nokia operates in approximately 130 countries and its turnover in 2021 was 22.2 billion euros. (Nokia 2022.)

2.1 Operating Environment Nokia Arena

Nokia Arena is an experience center located in Tampere, which seeks to provide new types of event experiences. The arena has the capacity for up to 15 000 spectators and has many facilities, such as a hotel, a casino, restaurants, and several types of shops. Its area is 50 000 m^2 and it hosts 140 events per year. (Nokia Arena 2022a.)

Most Nokia Arena’s events are concerts and sports events. There are also a few galas such as Iskelmä Gaala, but those are not currently the focus of the Nokia Arena events. Despite the name Nokia Arena, Nokia Corporation does not operate in the destination and such a large concept requires multiple partners. There are currently 18 partners in Nokia Arena; NoHo, Red Bull, Elisa, Lapland Hotels Arena, Tork, Löfbergs, Hartwall, Anora, Tampereen sähkölaitos, Pingviini, Outshine, Veikkaus, Ilves, Tappara, Lippu.fi, RTK palvelu, Abloy and Eezy. Current owners of the Nokia Arena are LähiTapiola solely, OP, Ilmarinen, SRV and the city of Tampere. (Nokia Arena 2022a.)

2.2 Design Sprint

This project was done in cooperation between three parties. Laurea University of Applied Sciences, Nokia Corporation, and teams of students.

The role of Laurea University of Applied Sciences was to facilitate the work between teams of students and Nokia representatives in the form of the thesis course of 2022 autumn. Course teachers made the initial contact with Nokia and took care of all administrative duties during the project.

Nokia corporation is a key partner of Laurea University of Applied Sciences and tasked the students to develop new business opportunities for Nokia Arena and 5G technologies. Representatives of Nokia were present in online sparring sessions during the week, giving their comments and insight on design by the teams during the first steps of the concept stage. Each team of students created their design concept and had frequent communication with Nokia representatives. This concept design utilizes features of 5G telecommunication networks in a comprehensive mobile application.

The prototype was completed in five days during the thesis course using the Design Sprint method originally written for Google Ventures. Design Sprint is a group project that should last uninterrupted four to five days of one work week for writing a design, prototyping, testing and analysis of the results as shown in figure 1. The goal of Design Sprint is prototyping new products, or test changes to existing products faster, at lower cost and with fewer risks included. Testing with real customers is also necessary to show the strengths and weaknesses of the proposed solution. (Knapp, Zeratsky & Kovitz 2016.)

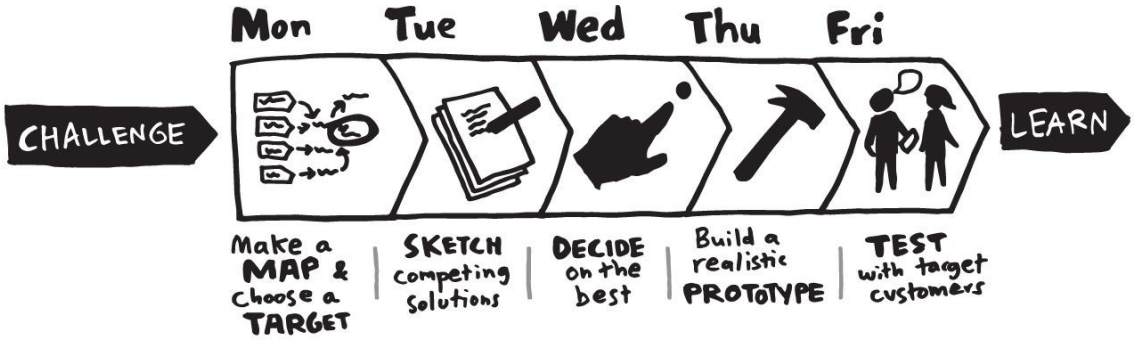

Figure 1: Knapp in Sprint: How to Solve Big Problems and Test New Ideas in Just Five Days (2016, 17)

Each team's Design Sprint was done in cooperation with staff from Laurea University of Applied Sciences and Nokia corporation. A five-day schedule provided by supervising teachers had set goals for each step of the process that was used as a template for the coursework, with minor changes to allow data gathering and interviewing.

Monday	Tuesday	Wednesday	Thursday	Friday
Orientation **Introduction** **Individual ideas** **Mind map** **Meeting with Nokia**	Concept design draft Benchmarking goals Start working on prototype Meeting with Nokia	Continuing with prototype Data gathering Finish Concept design Meeting with Nokia	Data analysis Interview Prototype finished Practice pitching	Pitching the concept to Nokia Team debriefing

Table 1: Design Sprint Schedule During 3-7 October 2022

Design Sprint outlined in the book is a blueprint for optimal results in the shortest possible time, and for first few times should be followed as close as possible to get the feeling of how things are done, according to Knapp, Zeratsky & Kovitz (2016, 233). Monday's tasks include writing down the goal of the project, understanding what factors will make the project fail or succeed and having a customer journey map that can be used in all subsequent steps during the rest of the week, summarizing a list by Knapp, Zeratsky & Kovitz (2016, 238). Tuesday is meant for developing and presenting all ideas that the participants have and drafting a winning design or a synthesis of several designs as the final product, according to Knapp, Zeratsky & Kovitz (2016, 241). In this coursework's modified timeline, the tasks for Monday and Tuesday were compressed into a single day where the chosen design emerged after the meeting with Nokia representatives.

In the proposed blueprint of plan of Knapp, Zeratsky & Kovitz (2016, 243-249) Wednesday is spent on polishing the details of the design and storyboarding every step of the prototype, and Thursday for building the prototype and writing the script for interviews, finally culminating on testing the prototype on Friday. This later half was quite extensively modified to suit the course work better and had more focus on the thesis process of data gathering than the prototype. In this project, Wednesday was spent on data gathering and planning the prototype and finalizing the concept design document that would be presented for the Nokia representatives on Friday.

Compared to the Design Sprint template, we had the best idea chosen early on, and more focused on data gathering instead of real-world testing. Qualitative data came from our Event mobile application questionnaire and personal interview with Mr. Matias Lahtinen. Concept was designed and written for three distinctive customer profiles since the mobile application needs to be easy to use, maintain and distribute. The three profiles are: customers who

would be willing to pay more for better service, customers with special mobility needs, and everybody else. The application was prototyped using Figma and the presentation was held in a Teams meeting, with the final design and prototype delivered to Nokia representatives.

3 Review of Related Concepts

Gathering of the knowledge base started a few weeks prior to the design sprint week. Studying was achieved individually on this part of the design project, learning more about the theory of core concepts and technologies. Nokia had provided materials that were accessible early on before the Sprint week. For more insightful information real devotion was required. Preliminary demand for opening the terms and technologies extensively was not the objective for the functional part of the design concept.

Studying and researching the concepts was helpful for understanding the concepts from Nokia's perspective. Although understanding of the technologies was not on expert level, the increased awareness of the concepts was helpful in the ideating part during the Sprint week. After pondering back and forth between a few ideas, the decision was made for the service design concept of the mobile application prototype. Ending up with this idea was logical considering that the application could put many of the technologies and concepts highlighted by Nokia in use.

Decision was to focus on stadium use cases and Nokia Arena as a platform with the requirements set by Nokia. Object was to create service concept that would benefit from the wireless mobile networks in the Nokia Arena. To function at a satisfactory level, the proposed mobile application would utilize the latest networking and mobile technologies, looking forward into the future technological progression in mind.

5G mobile networks with the millimeter wave (mmWave) technology provide fast and stable internet connections in crowded events and precise positioning inside the Arena (Elisa 2022). The application would also utilize edge computing for achieving real time usability with the help of mmWave. Edge computing additionally can ease development from a privacy standpoint when the data is distributed and analyzed near the source or at the edge of the network. (Klemetti & Kautonen 2022.)

From an accessibility standpoint the mobile application will pay close attention to people with disabilities. Supporting the already existing physical accessibility features of the Arena. Accessibility means easier moving in the Nokia Arena in this context and improvements towards it were focused on. Lastly the features of the mobile application will require the application to access personal and sensitive user data. Access such private user information

must be executed transparently so the users understand why the information is collected and that it is handled securely, following the data protection laws (Lazarovska 2022).

3.1 5G and the Millimeter Wave

5G is the new generation of cellular or mobile network technologies. Advancements of the 5G networks are its significantly faster down and upload speeds. The other improvement compared to older cellular networks is its larger bandwidth that helps support a larger number of devices simultaneously and without congestion. With the introduction of 5G, end devices with 5G capabilities have taken over the mobile device market. (Elisa 2022.)

5G mmWave (millimeter wave) is an improvement over the standard 5G cellular networks, mmWave can access to even larger bandwidth and is available in the frequency band spectrum over 24Ghz. These high frequencies enable faster and more reliable internet speeds with lower latency demonstrated in figure 2 (Chang & Edmondson 2022). Used with small cell base stations from the right distance, enable the benefits of mmWave technology in densely populated urban areas. (Abbey 2022.)

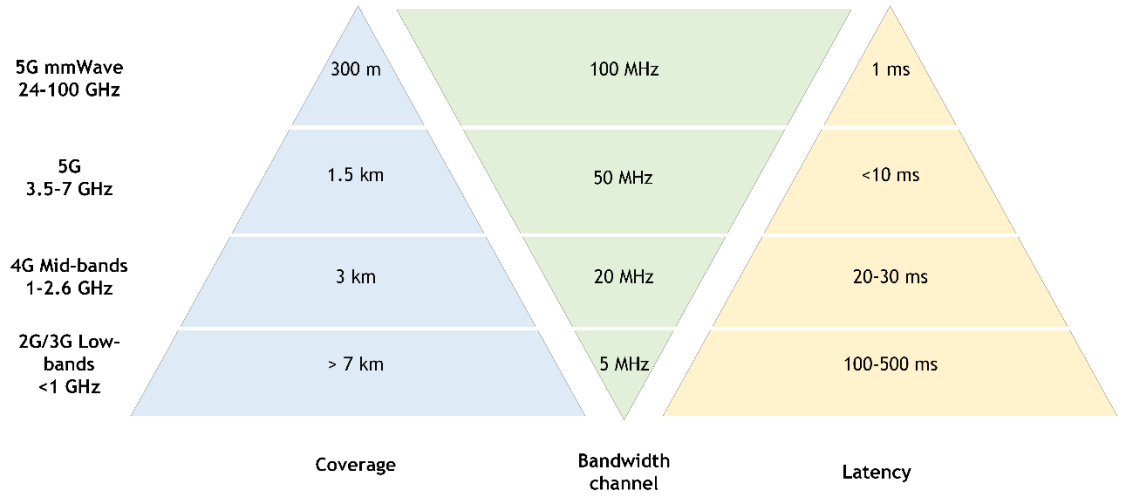

Figure 2: Frequency Bands from 2G to 5G mmWave (Chang & Edmondson 2022)

According to Tanna (2022) small cell's common use cases are inside of buildings such as stadiums or other spaces with high demand for mobile data usage. The downside of using 5G mmWave is its weak penetration capabilities and short coverage distance, thus the use cases for it are limited to central city hubs (Abbey 2022). 5G mmWave technology with its advancements over standard 5G networks is bringing wireless communication a step closer to the 6th generation of cellular or mobile networks. Forthcoming improvements will open many possibilities for new innovations.

With the rapid development of mobile networks, the role of standardization of technologies is even greater. The 3rd generation partnership project known as 3GPP is a standardizing

partnership that develops the 5G specifications. 3GPP unites telecommunication organizations together globally by providing a platform to define and cover new mobile telecommunications technologies. 3GPP focuses also on the backward compatibility of cellular networks, securing dual connectivity with the standardizations of new releases in 5G and LTE ecosystems for instance. The partnership project is ensuring the continuous evolution of mobile network connections. (Introducing 3GPP 2022.)

3.2 Positioning of Devices in 5G

For a long time, user equipment positioning has been achieved with GPS, the global positioning system. GPS is in fact a global navigation satellite system (GNSS) but devices with GPS sensors can usually also be assisted by wireless networks to achieve more accurate positioning. GPS has been a success commercially (Geotab Team 2022). Results for positioning are accurate outdoors but less so indoors because there is no required visibility for satellite signals and wireless networks have not been capable enough on their own for positioning devices in most scenarios.

Recent improvements and updates on 5G networks have made indoor positioning accurate down to the centimeter, to apply for new interesting commercial use cases (Peisa, Persson, Parkvall, Dahlman, Grøvlen, Hoymann and Gerstenberger 2020.) The mobile application concept would utilize the indoor positioning capabilities of 5G in its navigation features inside the Nokia Arena. The food and merchandise delivery feature of the application would be possible to execute when positioning and tracking measurements are precise. Of course, indoor positioning of devices is a challenging task due to 5G radio signals reflecting and fading inside buildings and urban areas are packed with physical barriers (Tanna 2022). The application is relying strongly on the development of the mobile network communication systems in the Nokia Arena and these barriers for radio signals might be an obstacle for reliable navigation systems in areas with weaker reception.

Location awareness of devices is enabling new functionalities and is a growing field of research these days. The new location functionalities are not just for accurate personal navigation use cases. The implementations of location aware devices are for instance utilized in intelligent transportation systems (ITS). The main idea behind the ITS solutions is enabled by self-aware location of devices with the help of advanced networks. Intelligent transportation and traffic systems are possible due to devices communicating and sharing locations with each other. These units of IoT-devices are forming intelligent and autonomous systems to apply for location-based services. (Tampere University 2022.) ITS applications have for example sped up the development of self-driving vehicles (European Commission 2022). For the further development of the concept application, the goal was that a location awareness-based system could be created from the location data of its users.

3.3 From Cloud to Edge Computing

Edge computing is a certain type of network architecture and is usually mentioned in situations when the data is being produced by IoT-devices or when the data is analyzed and stored near the place it is collected from. Definition of edge computing depends on the architecture and how it is formed, pointed out from the interview with Ella Peltonen (Lindström 2021). Generalization of 5G has accelerated the use of edge computing as a solution for network infrastructure. Edge computing is bringing applications more available without full dependency to connect to the cloud or data centers far away. (ITEwiki 2022.)

Main benefits of building systems around edge computing architecture are low latency for the users and better efficiency for the service provider, due to there being no need for transferring all the data to the cloud (Zieniūtė 2022). Edge computing lowers the need for transferring data to the cloud due to its nature of distributed data processing. Klemetti and Kauttonen (2022) consider that the development of edge computing is the consequence of a higher volume of data being produced nowadays, also pointing out that the development of more sophisticated and better performing devices has had its impact. The benefits of edge computing could also help lower the costs of running the networks which has increased the interest towards edge even more (Zieniūtė 2022).

What was thought to be beneficial for implementing edge computing with the concept application was its low latency times to make real time use of data practical. The application would utilize advancements of edge computing especially in the real time navigation and location of its users. With enough user information, real time crowd flow controlling could be achieved to help mitigate overcrowding in events. This would produce real value and enhancement for the users of the application and could even be scalable for other venues in the future not just for the Nokia Arena.

3.4 Accessibility

An important aspect for our development work of the application was the questions considering accessibility. From the questionnaire, (Airaksinen, V, Hyrri, M., Kannisto, R., Nieminen, V. & Roitto, L. 2022) one of the interesting findings was that accessibility is appreciated when people were thinking of reasons downloading event specific applications, even though the lack of accessibility was not a barrier for these people themselves. This led to the decision to focus on accessibility features considering people with mobility disabilities. The idea was to support and connect the physical accessibility features of the Nokia Arena with the assistance of the application.

The accessibility of the application also needs to be considered for people with different disabilities. As well as people are more aware of accessibility today and, for example, in the US there are instances where accessibility standards are a legal must. Especially when mobile

applications are linked to a physical location or when access to brand or business is only possible via web. Even though accessibility is not always legally required, it is recommended to have accessibility features, nonetheless. (Trichter 2022.)

According to Trichter (2022) accessibility helps to broaden the target audience. This was also thought through when selecting accessibility as one of the main aspects of the concept application during the sprint week. Increasing the target audience leads to more users in general, as well as us considering that there is a social responsibility aspect to this.

During the interview, we asked an experience specialist Matias Lahtinen what are the current issues that Nokia Arena has regarding accessibility in the facility. A few points were raised which were the current state of parking and traveling in narrow hallways with wheelchair (Lahtinen 2022). Previously Matias Lahtinen has stated in his column that assistants did not get seats next to their employees and when leaving the Nokia Arena, it took some time to get into elevators (Lahtinen 2021). The latter issues have since been addressed and the issue with narrow hallways fixes itself, since the main issue is people blocking the path.

One of the key features of the application is to provide its users with a map which shows routes to locations in Nokia Arena. Nokia Arena already has a visual map that shows accessibility route to the main entrance from parking lot, but it does not include routes to outlets, nor does it show other routes which are hard to travel to (Nokia Arena 2022b). Matias Lahtinen points out that during mid event interval rush hours, when there are 18 minutes or so time to get to outlets and make purchases, it is difficult to get done in time (Lahtinen 2022). This issue could be alleviated by providing the Nokia Arena application users with the possibility to place their purchases beforehand. One way to solve the inevitable issue with long lines on pickup points and so blocking hallways, is to place lockers around Nokia Arena, from which people can retrieve their purchases.

3.5 User Experience

User experience is a design method used to create digital experiences that are easy and convenient for the user. As the name suggests, the user is the centerpiece around whom everything is built in UX-design. While this method can be used for many different services and products, it is most utilized for digital interfaces. (Nichols & Chesnut 2014, 7-8.) This means that experience contains everything from interaction with user interface to the feel of individual actions in relation to the product or service.

According to Nichols and Chesnut (2014, 9), three key fundamental measurable aspects of user experience:

Usefulness is how well the product solves the user's needs. This does not simply mean basic functionality, but also includes aspects that improve the overall experience in a meaningful way. (Nichols & Chesnut 2014, 9.) Something like a food delivery application remembering what purchases one made previously or notifying the user that their product is about to arrive are part of how useful the service is.

Usability is something that is not noticeable, if it functions properly. It is what the user can do with the product with as little effort as possible. (Nichols & Chesnut 2014, 9.) This means that a mobile application's smooth operation when ordering products should not cause the user to focus on waiting for response, as an example.

Desirability causes the user to want to use the product. The product needs to have functions that are fun and engaging to use, which causes the customer to return and use the products again. This can be the colors, features, and stimulating content. (Nichols & Chesnut 2014, 9.)

The aspects of user experience mentioned are crucial for the success of a digital service. Frustration caused by a mobile application being unresponsive, slow, difficult to understand or forces to do something undesirable causes the user to seek other superior options. This could also cause the product to have a bad reputation if information is spread. (Nichols & Chesnut 2014, 9.)

3.6 AR (Augmented Reality)

Augmented reality combines artificial, often computer-generated content on top of real-world sensory perception. In augmented reality additional information enhances or transforms visual, auditory, haptic, olfactory, or somatosensory perception in a way that is as seamless and possible and indistinguishable from what is there, while in comparison virtual reality is meant to completely replace the sensory perception. Augmented reality is often used interchangeably with the term mixed reality.

Pokémon Go is one of the best-known examples today, and one of the highest revenue mobile games since it launched in 2016 (Koetsier 2021). Other ordinary uses for augmented reality include hearing aids, noise-cancelling headphones and displays in vehicles. According to Graunke (2022) the history of augmented reality starts with fighter jets in the 1960's and the earliest commercial implementations in the 1990's in sports casting highlighting events during the games.

4 Research Methodology

Research data was gathered with benchmarking, a questionnaire, and interview to gain the necessary information to better understand potential customers and understand what features are needed to reach set goals. When we formulated our topic for the application, we quickly understood the challenges when gathering representative data from people with disabilities, due to their small pool of the Nokia Arena visitors and the limited duration design sprint.

4.1 Benchmarking

Benchmarking is a process that is used to learn from other relevant examples to improve your own performance. It is important for a business to know the environment by comparing strategies, products, and services from other actors. This information is useful when deciding what a service must have to be competitive on the market. (Tuulaniemi 2011, chapter 3.)

While businesses co-operate often in different areas, they might not always be interested in sharing all their information with competitors on what makes their product or service work and stand out among others (Tuulaniemi 2011, chapter 3). Giving away that information is what would make others more competitive. Benefits of benchmarking are numerous, but the most significant are competitor's positive aspects can be used, repeating other's mistakes can be avoided, one can even use process aspects from other industries, easier to make strategic decisions with enough information and one can make sure to separate themselves from the competition. As can be deduced, benchmarking can be often done just by reading up on open sources like, for example, from company websites, by examining patents or using competitor services for testing. (Tuulaniemi 2011, chapter 3.)

For the mobile application prototype of this thesis case, we decided to use Wolt, Foodora, VR and HSL as comparison benchmark. Wolt and Foodora are both the most popular food delivery mobile applications in Finland (Talouselämä 2022). VR has delivery services for people with disabilities (VR 2022a), while HSL has route navigation and ticket functionality (HSL 2022).

Wolt is a technology company founded in Helsinki that makes it possible for customers to order a wide variety of products through one application. When ordered by a customer, a courier picks up the order and delivers it to the requested location. Main components in the service are merchants, couriers, and customers. (Wolt 2022.) The benefit of the customer being able to order products at any location is, in our opinion and research, useful at an event.

Foodora is like Wolt, as it seeks to assemble all Finland's restaurants under one service. There is a bonus program, where a customer accumulates points from a restaurant and these points can be used in next purchases to reduce the price (Foodora 2022). Returning customer

bonuses and the rewards system was something we considered for the mobile application prototype and added it to our questionnaire for further research.

Wolt and Foodora have proven solutions to problems that also are present in Nokia Arena for people with mobility issues. As an example, personal delivery reduces needed movement, which is useful for wheelchair users. Personalized lists of restaurants and bonus deals reward the user for installing these applications.

VR also offers delivery of restaurant products to wheelchair spaces and accessible sleeping compartments (VR 2022a). VR has sales trolleys on some of their trains, which tackles the issue of traveling by train in a wheelchair (VR 2022b). Having Nokia Arena outlets working in a more mobilized manner would benefit Nokia Arena from an accessibility point of view.

HSL application has most importantly, for our case, the map function (HSL 2022). It makes navigating outside much simpler and could potentially be useful inside large spaces with long hallways like arenas. Having the map shown during route selection gives intuitive perspective where one is located and if destination was selected successfully.

4.2 Interview

interview with Mr. Matias Lahtinen, who is a columnist for Jatkoaika web publication, provided this report with accessibility insight based on personal experience using the Nokia Arena services (Lahtinen 2022). Mr. Matias Lahtinen was approached for an interview based on his column on his experiences at the Nokia Arena during its opening week. Jatkoaika is a non-profit organization focusing on ice hockey related news and events (Jatkoaika 2022).

Semi-structured interview type utilizes questions from structured interviews, while combining them with open themes of unstructured ones. The semi-structured approach has questions which guide the interview, but it is possible to ask new questions as additional information arises. This type of data collection method is especially useful when the topic is not completely known, and researchers do not exactly know what questions need to be asked. (Wilson 2013, 24.) We considered that the semi-structured interview fit our situation the best, as there was limited time, and we did not initially know enough about the topic of accessibility challenges.

As semi-structured interviews are a qualitative way to gather data, it requires more time investment to explore all the topics. Therefore, it is useful to have from thirty minutes to an hour or two of time with the interviewee and this includes introduction, rapport, and the ending statements. Semi-structured interviews are useful in all areas of product development. (Wilson 2013, 25-26.)

An interview of this type is conducted with one person interviewing and another taking notes, recording, and helping the main interviewer. The other person should also be familiar with the topic so that they can take more accurate notes and write them down more efficiently. Following planned topics and questions also makes it easier to compare results between different interviews. (Wilson 2013, 26 & 28.)

4.3 Questionnaire

The other data gathering method we used was a questionnaire, which is also one of the most common data gathering methods. The benefits of this method are that it is simple to arrange and quick to spread through information channels like phone, physical paper, digitally and personally. Questionnaires often provide numbers-based statistics that are easy to compare and visualize. The negative is that it is impossible to tell how familiar the respondent is with the topic and how seriously they take it. (Ojasalo, Moilanen & Ritalahti 2015, 121.) It is useful to use both semi-structured interview and questionnaire to minimize blind spots in the information.

It is required to know the topic of the questionnaire well enough to the extent that one knows what questions to ask. Unlike semi-structured interviews, it is not possible to ask more questions directly during the process. Additionally, questions should be easy to understand and interpret for satisfactory data representation. (Ojasalo ym. 2015, 122-123.)
It was decided to use Google forms as the platform for our questionnaire as there was some experience with it and it is familiar for many who would be receiving the forms. The anonymous questionnaire had two multiple choice questions and one open comment in addition. It was kept simple to get as many answers as possible within the timeframe of Design Sprint. The questionnaire was sent to five different private WhatsApp groups of friends, acquaintances, and student organizations with 10-40 users each. This form of answerer selection has a risk of selection bias so it should be seen as potentially flawed (Ojasalo ym. 2015, 121).

The questionnaire regarding event application usage got 36 answers in time. All 36 answered the first question of if “Have you ever used a mobile application made specifically for a public event?”. This first question was mandatory, allowing only “yes” or “no” for answer (Airaksinen, V, Hyrri, M., Kannisto, R., & Nieminen, V. & Roitto, L. 2022)

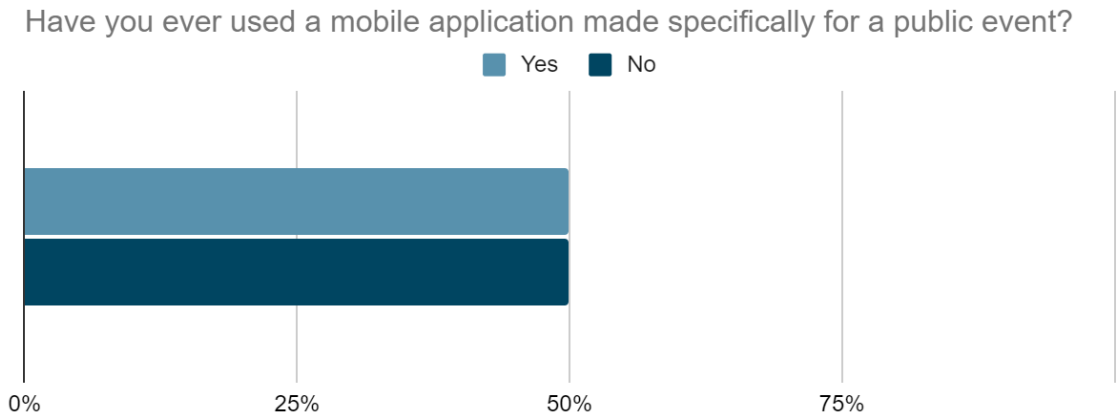

Figure 3: Have you ever used a mobile application made specifically for a public event?

Second question was “What would make you interested in downloading and using a mobile application made specifically for a public event? You can choose multiple options from below.” Overall, 35 answers to this question.

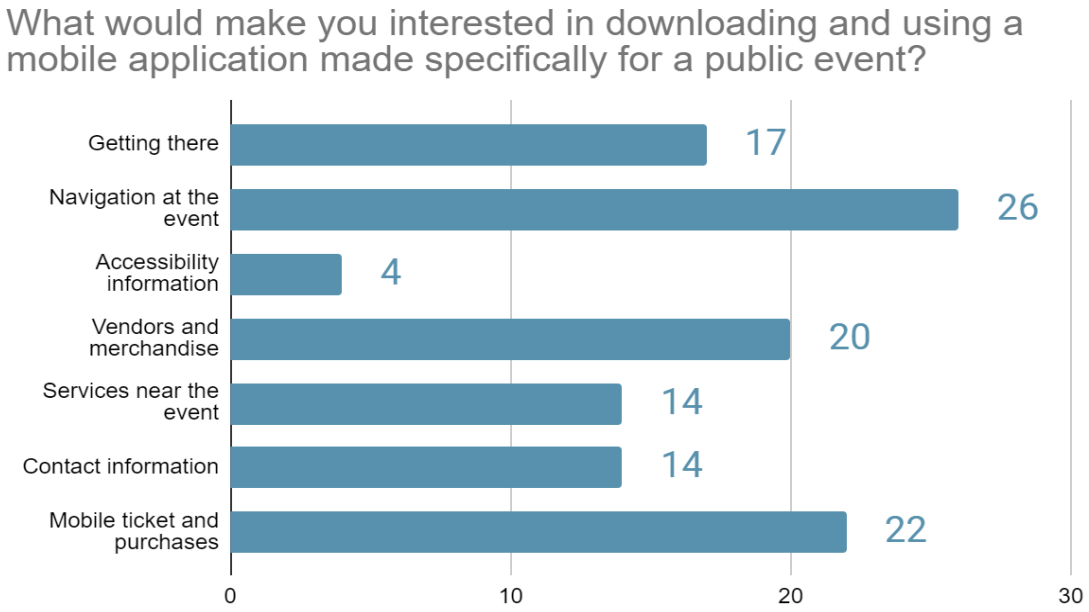

Figure 4: What would make you interested in downloading and using a mobile application made specifically for a public event?

Full choices for the answers that are abbreviated in figure 4 were:

1. Directions for getting there
2. Directions for navigating inside the event space
3. Accessibility information regarding the event
4. Information about vendors and merchandise at the event.
5. Information about other services near the event space
6. Contact information of the event organizers
7. Mobile ticket for the event and mobile payments inside the event space

Third question was “What else besides the reasons mentioned above would entice you to download and use event specific mobile application?” where people could answer anything, and we got 20 answers. Most answers were similar with the notion that they wanted to limit the number of applications installed, and the application needs to be exceptionally good to be worth their time and effort. Monetary rewards such as discount coupons, competitions and other interactive content, and scheduling assistant were deemed as most usable features. Being able to use the same application for multiple events and it does more than the public website were mandatory features for many (Airaksinen, V, Hyrri, M., Kannisto, R., Nieminen, V. & Roitto, L. 2022). Despite accessibility having the lowest share of requests, it surprised us that it was that high percentage overall.

5 Event Application Prototype

The creation of the prototype started by ideating and making wireframes during the second day of the design sprint, which was due to us being clear on our vision from the sparring session with Nokia representatives. The goal was to create an interactive mobile application prototype with a key focus on accessibility in Nokia Arena environment.

5.1 Design

The starting point of the application was charting the components of the design using service design principles (Aarnio, A., Harmoinen, P., Kaartti, V., Lahti, A. & Niittynen. M. 2022). Ticket types were based on the recognized customer profiles of VIP customers, accessible seating customers, and everybody else. Ticket type is the basis of the default settings for the application behavior. Vendors will gain real time information on crowd traffic patterns and queues and can make changes to their staffing or prices dynamically based on demand.

Accessible seating offers delivery by default, and the navigation map should reflect both accessible and currently less congested routes based on real time crowd tracking data. VIP seats have already optional catering service (Nokia Arena 2022c), but the application will offer more variety from all available vendors. Standard tickets' navigation shows fastest and least congested routes by default and has an option for delivery at extra fee.

Thinking about getting people to use the application will come down to the need. People visiting Nokia Arena for the first time for an event will use the route and map functions only if they have heard about the application beforehand. From our experience people tend to be more likely to get an application when recommended by others. The need therefore dictates the customer journey map, but by recommendation from their peers, it could be like in the chart in figure 5.

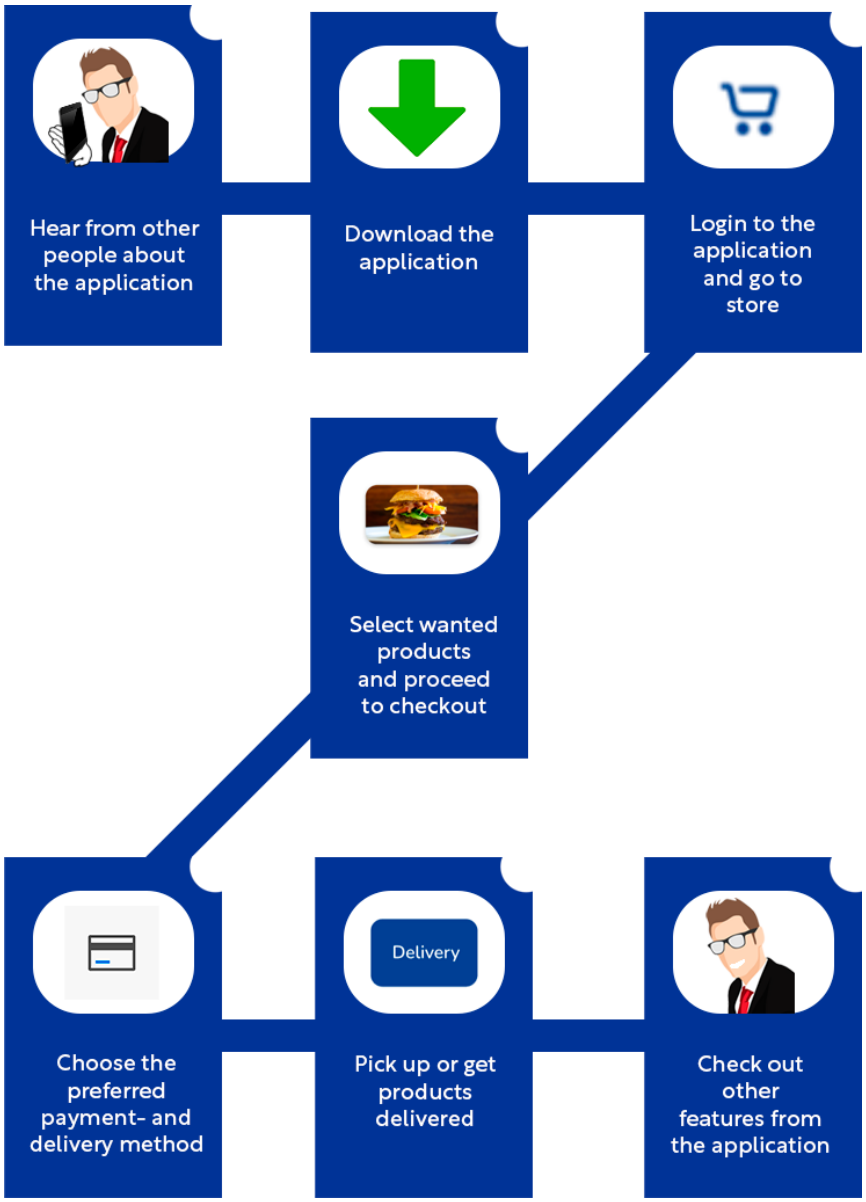

Figure 5: Customer Journey Map

First the user gets recommendations about the application's function of ordering products during their visit to maximize the time spent at the event and not waiting in line. This leads to downloading the application. After downloading and logging into the application, the user can navigate to the store section and buy select products that are available. Then, the user chooses the preferred payment method and the preferred delivery method that is available for them. After everything is paid for, the user can see their products being either delivered to them, or to a location indicated in the application. This last step will introduce the user to the map, which we think will also pique their interest to try other functions in the application.

When the use case changes from saving time spent in line to finding their seat or some other point of interest, the first two and the last steps are the same. Through word of mouth, the

user knows and downloads the application, but instead of navigating to store after logging in, they will go to map section. During the use of the map, they can use the AR view as well. From the map section, they get to their destination and are likely to check their product purchase possibilities.

Comprehensive user experience design was removed from the scope of our Design Sprint and our prototype is based on existing solutions from benchmark cases and is not polished for this application specifically. Once the application goes into production, full user experience development and research is necessary. Our mock-up user experience was developed further after we received data from potential users. The application was created using Figma software used for interface design. Main functions include tickets, shop selection and map view.

The first function that was designed was shop selection, as it presented numerous important accessibility possibilities. People with disabilities or other mobility issues can have many difficulties navigating the Arena searching for desirable places for purchases. Viewing the whole shop selection of Nokia Arena through an app and being able to order a product for a personal delivery or to a locker solves most of the issues involved. This sort of functionality was proven to work based on our benchmarked companies, such as Wolt (Wolt 2022) and Foodora (Foodora 2022). Optimized delivery inside the Arena also reduces queues as an additional benefit.

Map function was being planned during the second day of the design sprint, but during data gathering, it turned out to be one of the most desired features. This made us give it additional attention and augmented reality features. AR features also make better use of the 5G network made possible in the Arena, which was something Nokia was interested in us exploring.

The ticket function was also something that was deemed more important according to collected data from potential customers. It is something that makes sure that the application is worth installing on your phone. The ticket screen was not in the original plan but was added based on the questionnaire feedback and genuine need for the functionality.

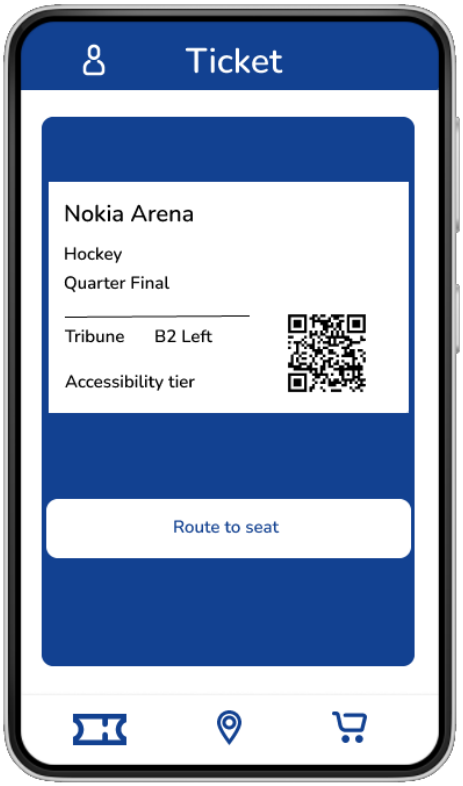

Figure 6: Ticket Screen

The ticket function provides the basic information about the event, seating and your personal accessibility needs. Different accessibility tiers give the user different map routes based on their personal settings and make it possible to order products to one's location. The illustration of the ticket is a hypothetical scenario of what it could look like, and the QR code we believe is a useful feature for the convenience of event customers. The "route to seat" button moves the user to the map screen and shows the route to location with the possibility to use AR features to make navigation easier. The bottom menu with three options contains the main functions of the application, which are ticket, map, and shop.

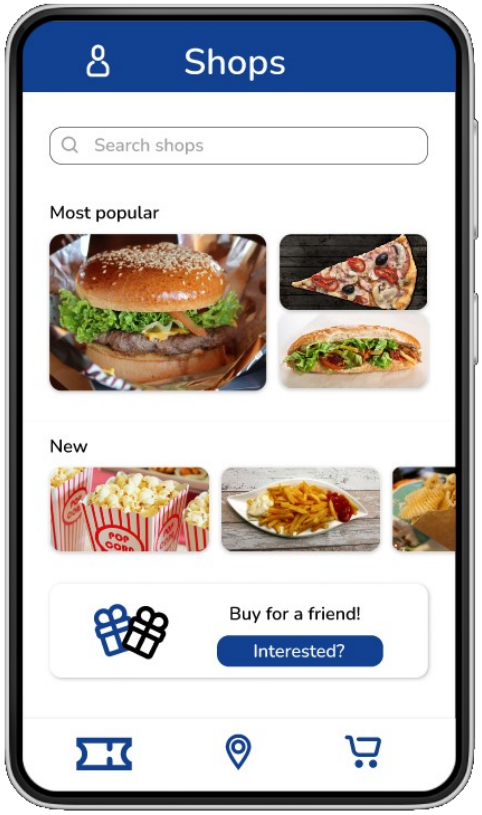

Figure 7: Main Shop Screen

The shop feature was the first and most important function to be included. Due to the amount of people and the complex nature of the environment in a location such as Nokia Arena, a service which would deliver products personally or to a locker makes it easier from an accessibility standpoint. Product delivery is also a proven service concept, which gave the possibility to benchmark with Wolt, Foodora and another unique delivery service by VR. Searching shops through the app would reduce queue times and possible exclusive offers give more reason to interact with the app. This provides many possibilities for potential business partnerships.

The main shop screen provides the user with several options. The top has a search function with the possibility to search for desired shops and restaurants. “Most popular” section show what is currently being purchased the most through the mobile application and changes accordingly. “New” section shows the new shopping locations or products available in Nokia Arena and it is a menu that is scrollable to the right direction. “Buy for a friend” is part of the exclusive offers idea that was heavily requested according to questionnaire research.

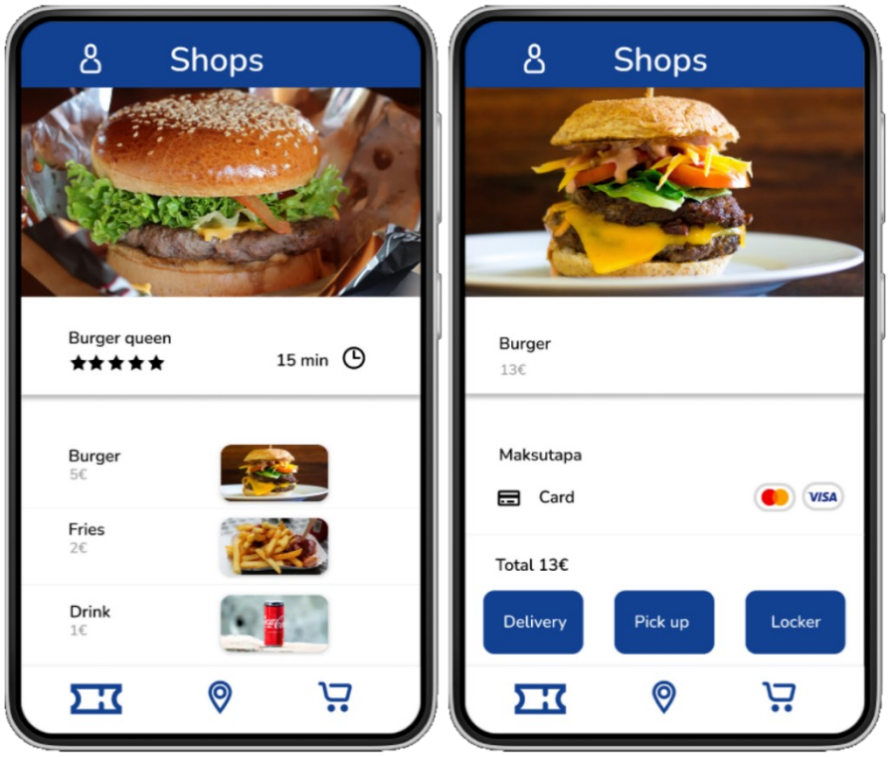

Figure 8: Vendor and Purchase Screens

The vendor screen is what the user sees when they select a restaurant or shop. Product page with details such as vendor rating and product selection options alongside prices. The purchase screen displays the product selected and to be purchased, with the price and payment options. Three buttons describe the different delivery options according to the ticket bought. “Delivery” option includes a courier delivering the customer’s product, “pick up” option leaves the product at a location where the customer can receive it themselves, while “locker” option includes leaving the product in a locker for pick up later or conveniently by phone authorization.

The thought behind designing the user interface of the application was with the user in mind. It is simple while familiar with other delivery applications that we benchmarked. Buttons are of similar shape and in unified spots between screens so as not to disorientate the user, which is also true for the bottom menu with three distinct functions as options that are always available on screen.

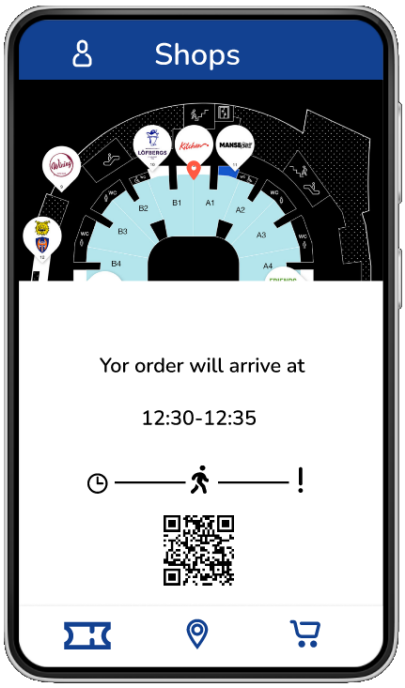

Figure 9: Personal Delivery Screen

Upon moving on from the order screen, the user gets one of the three ways of receiving the order. The first option is personal delivery with QR-code as authentication, which is by default for people with disabilities affecting mobility. The map indicates where the shop is located along with the courier delivering the requested product.

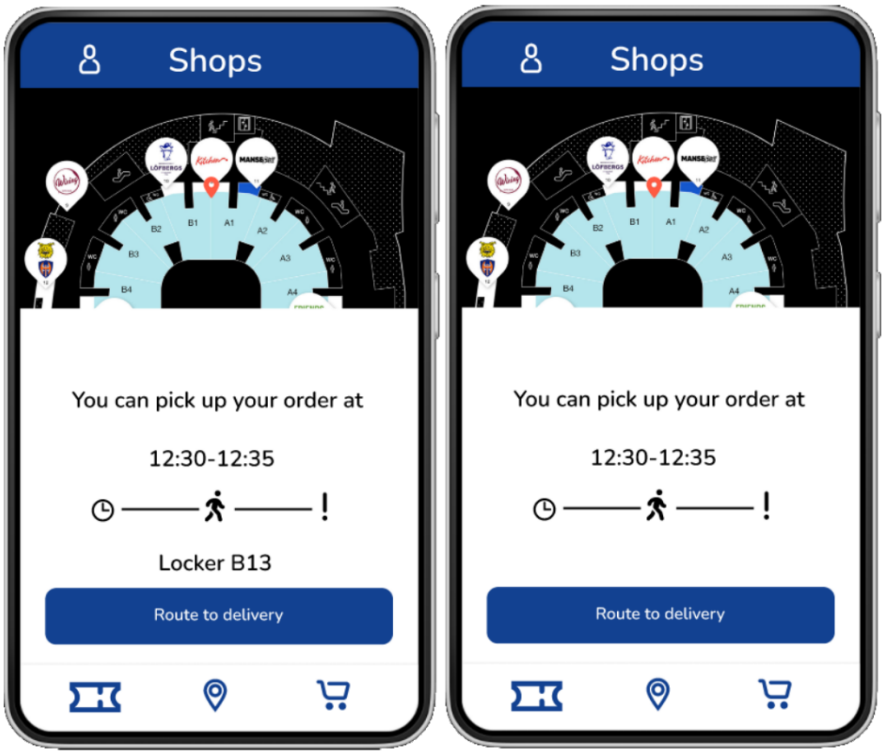

Figure 10: Locker Delivery and Pickup Screens

The pickup screen illustrates pickup from shop or restaurant feature and the main benefit is the reduction of queue times, as one can order and pay through the app. This is especially useful during event down times when human traffic is at its most significant, which is an inconvenience for people with disabilities.

The locker delivery screen shows the possibility to pick up one's order from a set locker location, which removes any human interaction and reduces concentration of people around restaurants and shops. The route to delivery button moves you to the Map screen, where the route is displayed. The locker number is indicated, and the customer can open it with their phone.

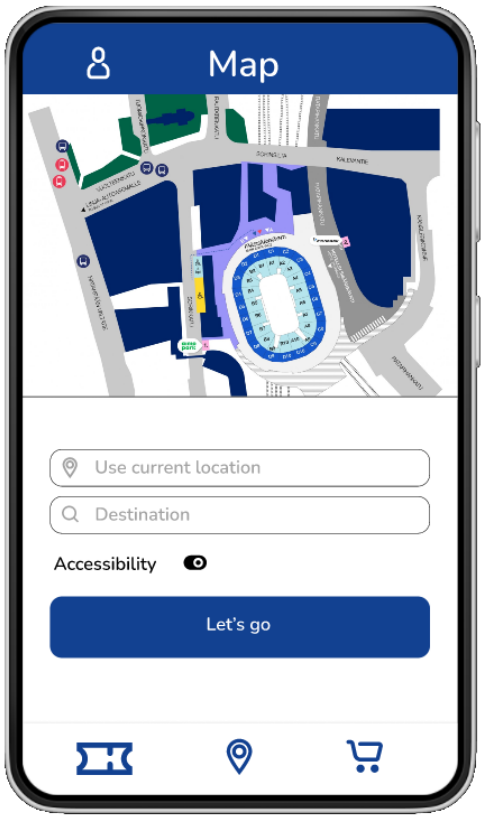

Figure 11: Accessibility Mode Activated Map Screen

The map function allows the user to get route information from the current or entered location to a specified destination. The map works around and within the Nokia Arena while displaying the route graphically as well as by text. Depending on ticket or preference, accessibility mode can be used to show the best route for people with mobility issues. AR camera view uses augmented reality to show directions depending on where the phone is pointed.

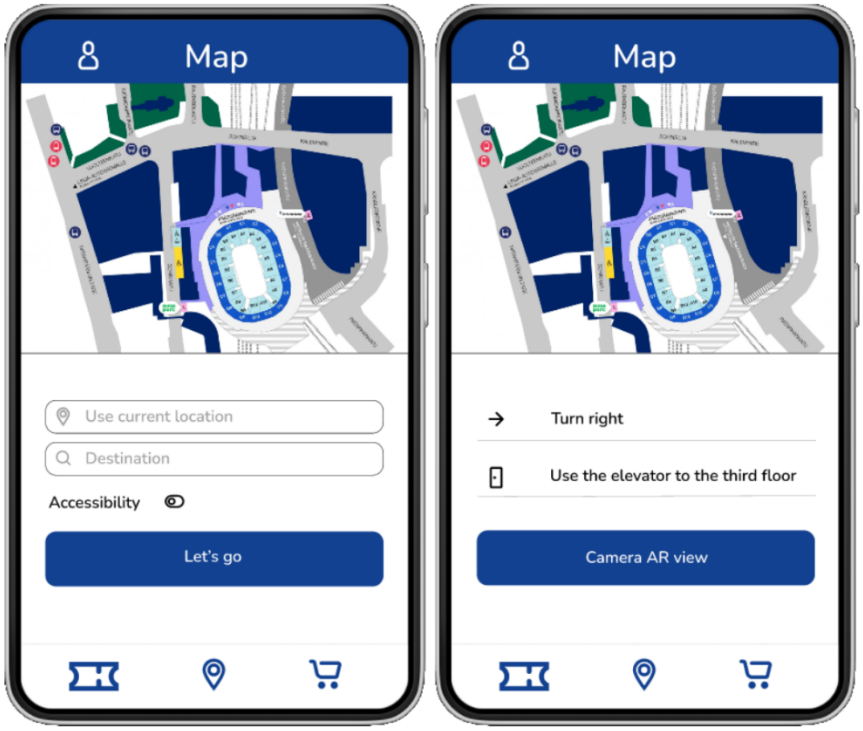

Figure 12: Accessibility Mode Deactivated and Route Selected Map Screens

Accessibility mode deactivated screen is otherwise identical to previous accessibility activated screen, except the option is deactivated. Route selected map appears when one has selected the desired destination. The directions are indicated on the map as well as in text in the middle of the screen.

Figure 13: AR Directions Screen

The AR feature is an extension of the map function. It uses the phone camera, and the user can view an augmented reality view through the screen. The view allows the user to see the route with arrows pointing along the floor in the correct direction. This gives a way of

orientating in the environment of Nokia Arena while using the available 5G indoor positioning and network.

The AR map itself benefits highly from edge computing. Having AR view may cause heating- and stuttering issues on older devices, so distributing calculation workloads elsewhere will mitigate some of the hardware limitations for the use of AR view. This will also have the additional benefit of being able to control crowd movement. Giving directions to avoid overcrowding will make traveling in Nokia Arena a more fluid experience for application users.

5.2 Feedback

To validate the application, we interviewed experience specialist Mr. Matias Lahtinen and demonstrated our unfinished prototype at the beginning of the fourth day of the design sprint. Matias Lahtinen criticized some of the accessibility possibilities of the Nokia Arena and we considered his expertise important when designing our prototype.

While all brought up issues could not be solved with a mobile application, there were others that could. Large numbers of people blocking hallways for wheelchairs can be lessened by the map function, which could consider traffic and plan the desired route around it. The map also solves the mentioned issue of not knowing what routes are navigable with a wheelchair by showing accessible routes.

Another problem encountered in Nokia Arena from an accessibility standpoint was the human traffic during half times, when a significant amount of people moves to the shops and food places. The food delivery function was deemed to be an adequate solution and got great feedback. People with wheelchairs often find it difficult to reach high desks at shops and restaurants, which is helped with direct personal deliveries.

Overall, the feedback received was positive and Matias Lahtinen considered the application to be potentially particularly useful. Other benefits of the designed application include that it creates a feeling for people with disabilities that they are considered as well. (Lahtinen 2022.) Nokia representatives also commented that the prototype was quite comprehensive, and possible to implement in a limited time (Hiisilä, P., Kemppinen, M. 2022).

6 Conclusion

The question that was answered in this thesis was by using benchmarking, interview, and a questionnaire: How we might improve the Nokia Arena going experience using a mobile application, while taking accessibility into account? According to the gathered data, there was desire for an event application with noteworthy features that also provides accessibility possibilities.

This design concept is a starting point for Nokia and Nokia Arena to develop and innovate mobile applications that benefit both the event goers and the vendors at the event venue. Using Service Design principles, three customer profiles are defined that need the most distinctive mobile experience and outlined potential services for their specific use cases. Benchmarking customer satisfaction and sales can be used during development and later when the mobile application is released to customers to gauge success and innovate new features.

Limited survey done on potential customers shows that people can be enticed to use an application made for the event venue if it adds to the value, but also aversion towards mobile applications that have no intrinsic value. Therefore, any application that is to be released to the public needs to offer something tangible, discounts for example. The added monetary value of the application is most straightforward to achieve in cooperation with the vendors and business partners of the area venue that can use it as a part of their marketing campaign to acquire new customers. The specialist interview highlighted accessibility problems for the disabled people at events, which was considered when designing the application.

Assuming the adoption rate of the application is high enough, Nokia Arena will be able to use the gathered data for better management of crowds, security of the venue and targeted advertising, and the same benefits can be scaled to any other event venue that has the necessary 5G technology available. Nokia could use the larger product portfolio of both hardware and software solutions to boost the adoption of their network technologies to more venues around the world.

This concept design is not fully complete and ready for production, leaving several avenues open for future research and development. Most important would be running global surveys to measure what kinds of good and bad experiences, and needs the public has when it comes to mobile applications that enhance event experiences in ways that were not envisioned in this design. Up to date customer data and customer surveys from the Nokia Arena would also be needed to measure current shopping habits for benchmarking the application when it is available for public use.

As the concept design currently stands, it takes into consideration the starting goal, which is to provide the Nokia Arena visitors with improved experience while keeping accessibility as a base of design for each of the service points.

References

Printed

Knapp, J., Zeratsky, J. and Kovitz, B. 2016 Sprint: How to Solve Big Problems and Test New Ideas in Just Five Days. New York: Simon & Schuster

Electronic

3GPP. 2022. Introducing 3GPP. Accessed 28 October 2022. https://www.3gpp.org/about-us/introducing-3gpp

Aarnio, A., Harmoinen, P., Kaartti, V., Lahti, A. & Niittynen. M. 2022. Johdanto palvelumuotoiluun. [online lecture notes]. From the Canvas workspace. Accessed 2 November 2022. https://canvas.laurea.fi/courses/4826

Abbey, N. 2022. 5G mmWave Technology: What you need to know?. Posted 3 August. Accessed 18 October 2022. https://www.stl.tech/blog/5g-mmwave-technology-what-you-need-to-know/

Chang, Y & Edmondson, J. 2022. 5G Technology, Market and Forecasts 2022-2032. Accessed 20 October 2022. https://www.idtechex.com/en/research-report/5g-technology-market-and-forecasts-2022-2032/835

Elisa. 2022. 5G. Accessed 28 October 2022. https://elisa.fi/5g/

European Commission. 2022. Intelligent transport systems. Accessed 27 October 2022. https://transport.ec.europa.eu/transport-themes/intelligent-transport-systems_en

Figma. 2022. Accessed 6 October 2022. https://www.figma.com/

Foodora. 2022. Tietoa Foodorasta. Accessed 26 October 2022. https://www.foodora.fi/contents/about.htm

Geotab Team. 2022. What is GPS?. Posted 22 May. Accessed 27 October 2022. https://www.geotab.com/blog/what-is-gps/

Graunke, A. 2022. The history of Augmented Reality. Accessed 29 October 2022. https://www.toptal.com/insights/innovation/history-of-augmented-reality

HSL. 2022. Reittiopas. Accessed 26 October 2022. https://www.hsl.fi/en

ITEwiki. 2022. Accessed 24 October 2022. https://www.itewiki.fi/opas/reunalaskenta/

Jatkoaika. 2022. Tietoa jatkoajasta. Accessed 27 October 2022. https://www.jatkoaika.com/tietoa-jatkoajasta

Klemetti, A. & Kauttonen, J. 2022. Älyä pilvessä ja reunalla – tekoälyn hyödyntäminen reunalaskennassa. Posted 7 September. Accessed 24 October 2022. https://esignals.fi/pro/2022/09/07/alya-pilvessa-ja-reunalla-%E2%80%92-tekoalyn-hyodyntaminen-reunalaskennassa/#1c9617e1

Koetsier, J. 2021. 7 Mobile Games Now Make Over $100 Million Every Month. Forbes. Accessed 29 October 2022. https://www.forbes.com/sites/johnkoetsier/2021/08/11/7-mobile-games-now-make-over-100-million-every-month/

Lahtinen, M. 2021. Nokia Arenan esteettömyydessä on paljon hyvää, mutta yksi asia häiritsee katsomokokemuksen osalta. Posted 5 December. Accessed 27 October 2022. https://www.jatkoaika.com/Kolumni/Nokia-Arenan-esteett%C3%B6myydess%C3%A4-on-paljon-hyv%C3%A4%C3%A4-mutta-yksi-asia-h%C3%A4iritsee-katsomokokemuksen-osalta/237509

Lazarovska, M. 2022. What is GDPR and how does it affect software companies?. Accessed 29 October 2022. https://www.it-labs.com/what-is-gdpr-and-how-does-it-affect-software-companies/

Lindström, S. 2021. Reunalaskenta ja Edge AI tulevat helpottamaan datan käsittelyä – Tutkijan mukaan innovatiivisilla yrityksillä on nyt loistava sauma osallistua kehitystyöhön. Posted 17 June. Accessed 24 October 2022. https://www.itewiki.fi/blog/2021/06/reunalaskenta-ja-edge-ai-tulevat-helpottamaan-datan-kasittelya/

Mäkilä, V. 2022. Wolt ja Foodora käyvät suurta taistelua suomalaisten suosiosta – Tässä Foodoran salainen ase. Talouselämä. Accessed 26 October 2022. https://www.talouselama.fi/uutiset/wolt-ja-foodora-kayvat-suurta-taistelua-suomalaisten-suosiosta-tassa-on-foodoran-uusin-ase/c6ae439e-b8d7-447d-83af-efbffa90d38b

Nichols, K & Chesnut, D. 2014. UX for Dummies. For Dummies. E-book. Chichester: John Wiley & Sons, Ltd. Referenced 28 October 2022.

Nokia. 2022. About. Accessed 10 October 2022. https://www.nokia.com/fi_fi/about-us/company/historiamme/

Nokia Arena. 2022a. Arena information. Accessed 27 October 2022. https://nokiaarena.fi/en/information/arena-information/

Nokia Arena. 2022b. Accessibility and easy access. Accessed 28 October 2022. https://nokiaarena.fi/en/directions/accessibility-and-easy-access/

Nokia Arena. 2022c. Boxes and Reservations. Accessed 28 October 2022. https://nokiaarena.fi/en/services/boxes-and-reservations/

Ojasalo, K., Moilanen, T., & Ritalahti, J. 2015. Kehittämistyön menetelmät. 3.-4. edition. E-book. Helsinki: Sanoma Pro Oy. Referenced 25 October 2022.

Peisa, J., Persson, P., Parkvall, S., Dahlman, E., Grøvlen, A., Hoymann, C., & Gerstenberger, D. 2020. 5G evolution: 3GPP releases 16 & 17 overview. Article from Ericson technology review magazine. Accessed 21 October 2022. https://www.ericsson.com/en/reports-and-papers/ericsson-technology-review/articles/5g-nr-evolution#:~:text=Release%2016%20introduces%20enhanced%20beam,in%20the%20uplink%20(UL)

Pörssitieto. 2008. Nokia. Accessed 10 October 2022. https://www.porssitieto.fi/scripo/nokia.shtml

Tampere University. 2022. Wireless research. Accessed 27 October 2022. https://research.tuni.fi/wireless/research/positioning/

Tanna, B. 2022. All You Need to Know About 5G Small Cell Systems. Posted 13 June. Accessed 18 October 2022. https://www.stl.tech/blog/all-you-need-to-know-about-5g-small-cell-systems/

Trichter, D. 2022. Mobile Apps Accessibility Guidelines. Accessed 25 October 2022. https://www.accessibilitychecker.org/guides/mobile-apps-accessibility/

Tuulaniemi, J. 2011. Palvelumuotoilu. E-book. Alma Talent. Referenced 2 October 2022.

Zieniūtė, U. 2022. Mitä on edge computing eli reunalaskenta?. Posted 7 August. Accessed 25 October 2022. https://nordvpn.com/fi/blog/reunalaskenta/

Wilson, C. 2013. Interview Techniques for UX Practitioners: A User-Centered Design Method. E-book. USA: Elsevier Science & Technology. Referenced 24 October 2022.

Wolt. 2022. About. Accessed 26 October 2022. https://wolt.com/fi/about

VR. 2022a. Accessible train travel. Accessed 26 October 2022. https://www.vr.fi/en/facilities-and-services/accessible-train-travel

VR. 2022b. Sales trolley. Accessed 27 October 2022. https://www.vr.fi/en/facilities-and-services/sales-trolley

Unpublished

Airaksinen, V, Hyrri, M., Kannisto, R., Nieminen, V. & Roitto, L. 5 October 2022. Event mobile application questionnaire. Laurea University of Applied Sciences. Unpublished.

Lahtinen, M. Interview. 6 October 2022. Personal communication.

Hiisilä, P., Kemppinen, M. 7 October 2022. Personal communication.

Figures

Tables

Appendices

Appendix 1: Questionnaire

Our anonymous questionnaire regarding event application usage got 36 answers in time. All 36 answered the first question of if “Have you ever used a mobile application made specifically for a public event?”. This first question was mandatory, allowing only “yes” or “no” for answer.

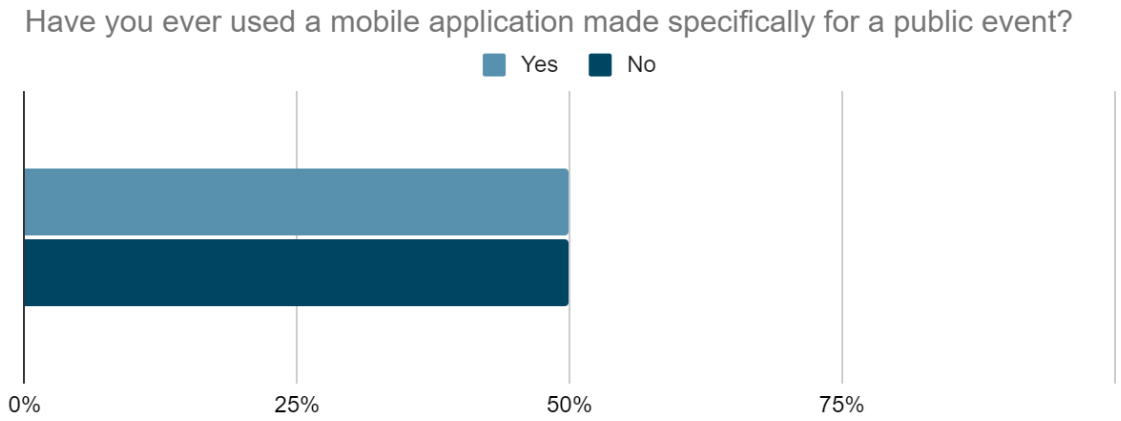

Figure 14: Have you ever used a mobile application made specifically for a public event?

Second question was “What would make you interested in downloading and using a mobile application made specifically for a public event? You can choose multiple options from below.” We received 35 answers to this question.

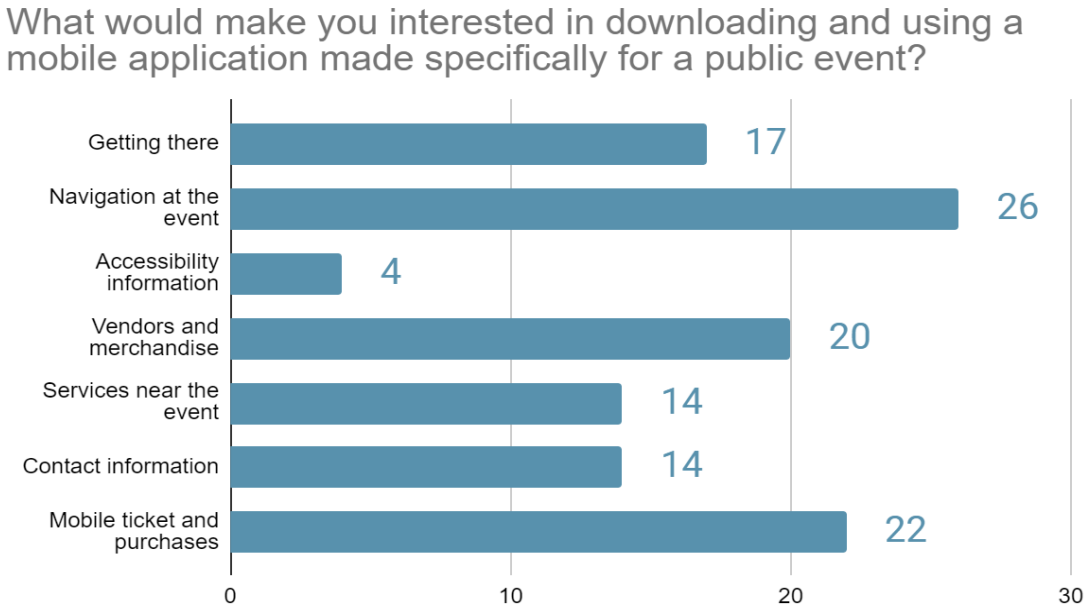

Figure 15: What would make you interested in downloading and using a mobile application made specifically for a public event?

Full choices for the answers that are abbreviated in figure 2 were:

1. Directions for getting there
2. Directions for navigating inside the event space
3. Accessibility information regarding the event
4. Information about vendors and merchandise at the event.
5. Information about other services near the event space
6. Contact information of the event organizers
7. Mobile ticket for the event and mobile payments inside the event space

Third question was “What else besides the reasons mentioned above would entice you to download and use event specific mobile application?” where people could answer anything, and we got 20 answers. Most answers were similar with the notion that they wanted to limit the number of applications installed, and the application needs to be exceptionally good to be worth their time and effort. Monetary rewards such as discount coupons, competitions and other interactive content, and scheduling assistant were deemed as most usable features. Being able to use the same application for multiple events and it does more than the public website were mandatory features for many.