

# User Needs of Polar Flow Service:

Case Polar Electro Oy

Kaisa Maljanen

Master's thesis

Industrial design

Faculty of Art and Design

University of Lapland

2025

## **University of Lapland, Faculty of Art and Design**

**Author:** Kaisa Maljanen

**Title:** User needs of Polar Flow service: Case Polar Electro Oy

**Type:** Master's thesis

**Degree programme:** Industrial Design

**Number of pages:**

**Number of appendices:**

**Year:** 2025

### **Abstract**

This research focuses deepening the understand of the user experience and the user needs of the Polar Flow service. The Polar Flow service is used together with Polar wearable technology like sport and fitness watches. The service can be divided to a web and a mobile application and the main interest of this thesis is the Polar Flow mobile application. The phenomenon of this thesis is related to user experience, user interface, human-computer interaction and user centric design.

The thesis process follows the Design Council's Double Diamond process and focuses on discovering and defining the user needs and delivering design proposals for Polar service development. The research question was set to be: *What types of user needs the Polar Flow users have?* I am presenting answers to this question by presenting the research results in detail.

The research data was gathered by conducting semi-structured theme interviews and an online survey. The interviewees were asked about their training and exercise background, their usage of the Polar Flow service and lastly a design concept was evaluated with the users. They were shown parts of a design concept and answering questions related to it in order to evaluate the design. The online survey questions utilised the Mobile Application Rating Scale questionnaire that has been developed in the Queensland University of Technology. Some of the questions were modified to suit better Polar's interests and to be easy for the participants to answer. All participants were current users of the Polar Flow service.

The research findings deepen the understanding of the user experience of the Polar Flow application. The research findings show that the user needs of the Polar Flow users are related to self-tracking. The users find it interesting to track their exercise and sleep data. The results show as well that overall, the app meets the users' needs.

At the end of this thesis, I am presenting design proposals for Polar service development that are based on a design brief from Polar. In addition, I am presenting user needs related to the topic of the design assignment. The design proposals present UI concepts for Polar Flow application.

**Keywords:** User experience, user needs, wearable technology

## Lapin yliopisto, Taiteiden tiedekunta

**Tekijä:** Kaisa Maljanen

**Työn nimi:** Polar Flow -palvelun käyttäjätarpeet: Tapaus Polar Electro Oy

**Työn laji:** Pro gradu -tutkielma

**Koulutusohjelma:** Teollinen muotoilu

**Sivumäärä:**

**Liitteet:**

**Vuosi:** 2025

### Tiivistelmä

Tässä tutkimuksessa keskitytään syventämään ymmärrystä Polar Flow -palvelun käyttäjäkokemuksesta ja käyttäjien tarpeista. Polar Flow -palvelua käytetään yhdessä Polarin puettavan teknologian, kuten urheilu- ja fitnesskellojen kanssa. Palvelu on jaettavissa web- ja mobiilisovellukseen ja tämän tutkielman pääkiinnostuksen kohteena on Polar Flow -mobiilisovellus. Tämän tutkielma liittyy käyttäjäkokemuksen muotoiluun, käyttöliittymäsuunnitteluun, ihmisten ja laitteiden väliseen vuorovaikutukseen sekä käyttäjäkeskeiseen muotoiluun.

Tutkielma noudattaa Design Councilin Double Diamond -prosessia ja keskittyy käyttäjien tarpeiden kartoittamiseen ja kiteyttämiseen sekä suunnitteluehdotusten toimittamiseen Polarin palvelukehitystä varten. Tutkimuskysymykseksi asetettiin seuraava kysymys: *Millaisia käyttäjätarpeita Polar Flow -käyttäjillä on?* Esitän vastaukset tähän kysymykseen esittelemällä tutkimustulokset yksityiskohtaisesti.

Tutkimusaineisto kerättiin puolistrukturoiduilla teemahaastatteluilla sekä verkkokyselyllä. Haastateltavilta kysyttiin heidän harjoittelu- ja liikuntataustastaan, Flow -palvelun käytöstä ja lopuksi arvioitiin muotoilukonseptia käyttäjien kanssa. Osallistujille näytettiin osia konseptista ja he vastasivat siihen liittyviin kysymyksiin konseptin arvioimista varten. Verkkokyselyn kysymyksissä hyödynnettiin Queenslandin teknillisessä yliopistossa kehitettyä Mobile Application Rating Scale -kyselylomaketta. Osa kysymyksistä muokattiin vastaamaan paremmin Polarin kiinnostuksen kohteita varten ja, että osallistujien olisi helppo vastata kysymyksiin. Kaikki osallistajat olivat Polar Flow -palvelun nykyisiä käyttäjiä.

Tutkimustulokset syventävät ymmärrystä Polar Flow -sovelluksen käyttäjäkokemuksesta. Tutkimustulokset osoittavat, että Polar Flow -käyttäjien käyttäjätarpeet liittyvät oman mitatun datan seurantaan. Käyttäjien mielestä on mielenkiintoista seurata liikunta- ja unitietojaan. Tulokset osoittavat myös, että sovellus vastaa kaiken kaikkiaan käyttäjien tarpeita.

Tämän tutkielman lopussa esitän Polarin palvelukehitystä varten kehitysehdotuksia, jotka perustuvat Polarilta saatuun toimeksiantoon. Lisäksi, esittelen toimeksiannon aiheeseen liittyviä käyttäjien tarpeita. Suunnitteluehdotuksissa esitellään Polar Flow -sovellukseen käyttöliittymäkonsepteja.

**Avainsanat:** Käyttäjäkokemus, käyttäjätarpeet, puettava teknologia

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## 1 INTRODUCTION

Wearable technology has become more popular and noticeable in everyday life. This trend shows almost everywhere one goes. One can notice that wearables like smartwatches, sport and fitness trackers, fitness bands and smart rings have become accessories that are widely used. On top of being connected from our wrists, we carry a smart phone in our pockets. This thesis dives into the topic of the wearable technology by focusing on Polar Electro Oy's products and services.

### 1.1 Background

Digitalisation has increased the use of smart devices. Today, 97% of Americans own a cellphone and 85% of these people own a smartphone. The usage of smartphones has increased significantly in the 2020s compared to 2010s. For example, during 2011 only 35% of Americans owned a smartphone. Recent studies also show that 28% of U.S. adults aged 18–29 are smartphone dependent. (Pew Research Center 2021.)

Finnish people aged 16–89 use the internet multiple times a day. From that age group, 82% had used the internet in 2020. The usage of internet among Finnish people has also changed during 2020. 54% of people aged 16–89 had purchased products or services online which is 4% more than the previous year. Statistics show that 30% of Finnish people use smart watches and exercise machines that are connected to the internet. In addition, 98% of people aged 16–24 had used internet with a mobile phone during the last three months. (Suomen virallinen tilasto [SVT] 2021, 1–2, 10.) The change and increase of internet usage can be due to the COVID-19 pandemic. It is likely that the usage of internet will keep changing and growing after the pandemic.

Wearable Technology refers to the technical devices that people wear on their bodies. These devices gather information independently from the users. Wearable Technology can be anything from a textile to a smartwatch or a sensor. Consumer electronics are devices people use in their daily lives, and these include for example wristbands, smart watches, and rings.

Through these devices, users can monitor for example their sleep, heart rate and daily activity. Wearable technology is mostly used in healthcare products, electronic devices, and textile products. It is suggested that in the future, wearable technology will make life more comfortable for people with disabilities, increase safety in different systems and fashion garments will start to monitor humans' metrics. (Chakravarthy, Babu & Rao 2021, 127–128.) Functionality and form factors related to the industrial design of the product have been found to be the most important features of wearable technology for users. For example, jewel-like devices are preferred among female users. (Rantakari, Inget, Colley, Häkkinen 2016, 2.) This shows that as technology has evolved, products have become fashionable and the way products look like is more important to users.

Physical activity is linked to crucial health benefits, and it has shown to prevent many chronic diseases including for example diabetes, cardiovascular diseases, and different types of cancer. Physical activity improves both physical and mental health, cognitive health, sleep, and overall quality of life. It is estimated that one in four adults – 1.4 billion adults – worldwide are not active enough to meet the recommended physical activity levels. Insufficient physical activity and the increase of sedentary lifestyle are mainly due to passive transportation, sitting for long periods of time at work and at home. In addition, inactive spare time increases passive behaviour. Replacing inactive time to be more physically active at any intensity level has shown to support health benefits. (World Health Organisation 2020.) Wearable technology can support people to meet the requirements of physical activity as wearable technology can monitor for example biological and behavioural outcomes as well as physical activity and performance. This technology often utilises sensors which can be used to track users' geographic locations during physical activities. These devices are often supported by mobile applications that encourage user-interaction with the devices. (Girginov, Moore, Olsen, Godfrey, Cooke 2020, 2, 7.)

The topic of wearable sport technology and fitness applications is interesting because of the COVID-19 pandemic, growing health problems globally and the growing digitalization of the world. It is an interesting discussion what wearables can solve for these problems and how they can adapt to the various user needs in a changing modern society. Research on mobile health technology recommends that low-cost technology like mobile applications

can be used to educate people about coronavirus and how to prevent it from spreading. (Williams, Adeyemi, Eyitayo, Odeyemi, Dada, Adesina & Akintayo, 2020).

This thesis focuses on sport and wearable technology by focusing on Polar Electro Oy's products and services. My personal journey at Polar started in 2021. I was recruited to work with Polar Flow service as a part of Polar's UX design team and more specifically as a part of the mobile UX team. This means that I am mainly designing the mobile app side of the Polar Flow service. During my time at Polar, I have got to learn about Polar and dive into wearable technology in the health and fitness monitoring field. I got interested in Polar because I believe as a designer that usability and user experience are in the core of designing human performance monitoring wearables and fitness applications. I saw the UX design position as an opportunity that will shape my own identity as a designer and teach me hands-on how to apply design theory and skills in my work. I am continuing my journey by doing my master's thesis for Polar in the Industrial Design Master's Degree Program to further deepen my understanding of user experience (UX) design and user interface (UI) design in the presented product field. In addition, my thesis will benefit Polar's product and service development in the future.

## **1.2 Polar Electro Oy**

Polar has been producing wearable sports technology products which monitor human performance since 1977. These technical innovations include for example sport watches, bike computers and heart rate sensors. Polar offers products for all fitness levels from athletes to people who want to live a healthier lifestyle. Thus, Polar has a broad range of products to choose from. Polar offers multiple services from business-to-customer (BTC) to business-to-business (B2B) services. These services give advice and support while using Polar health and fitness monitoring wearables. (Polar 2024.)

Polar's products and services are backed with physiological research. Polar has its own in-house Polar Research Center which does studies regarding wearables, biosignal technologies, sleep and recovery, physical activity, sports nutrition and exercise. The research center does collaborations globally. (Polar 2024.)

Polar users get feedback and guidance based on their own metrics. Combined with *Polar Smart Coaching*, users get guided towards balancing training and recovery to achieve their fitness targets. Polar Smart Coaching features include for example *Nightly Recharge* which gives feedback on night-time recovery. (Polar 2024.) These features can be found from Polar watches and from the Polar Flow service.

The Polar wearable devices can be paired and used with the Polar Flow service. The service has two sides: Flow web application and Flow mobile application. Polar Flow app is a BTC mobile fitness application which allows users for example to track their sleep, record their workout sessions and see their daily activity. Users can view their statistics and data in more depth through the Polar Flow web application. (Polar 2024.) The mobile application is the research subject and interest of this thesis. Figure 1 presents the sleep feature in the Polar Flow application and gives an example on how the app looks like.

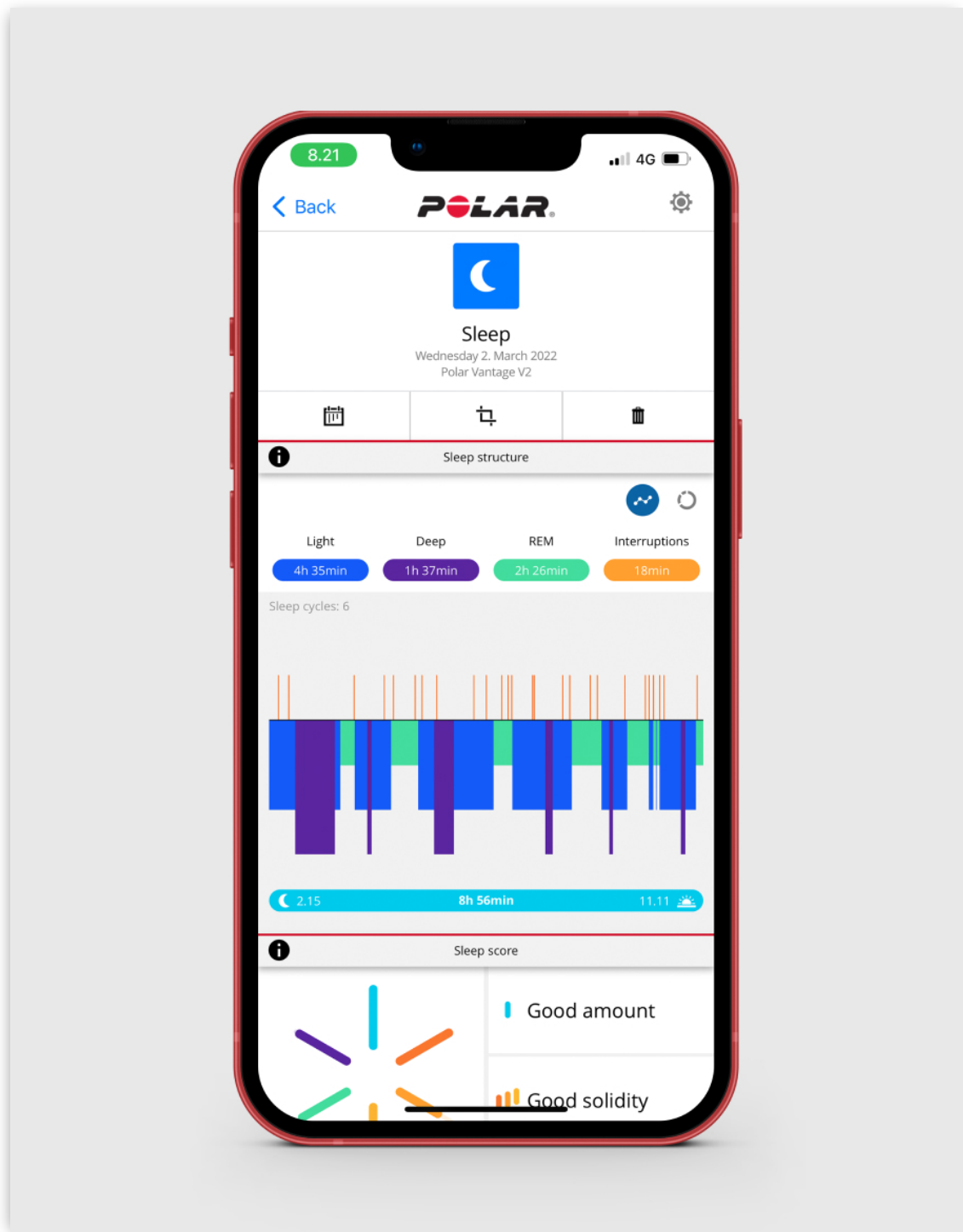


Figure 1: Sleep data on the Polar Flow application. (Source: <https://www.polar.com/en/flow>).

### 1.3 Research Question

Design is about understanding what the targeted users want from a product. It targets to solve a problem the user has. Designers try to understand and solve the user problems by identifying the user needs from these problems. User needs include all preferences, goals and expectations the user has while using a product. These needs are associated with functionality, usability, aesthetics and subjective satisfaction. By engaging with the users with various research methods, designers get insights and can find out hidden needs. (Interaction Design Foundation 2016a.) The research question of this thesis is set to find out what the hidden needs of Polar Flow users are.

Hence, the main purpose of this thesis is to research how interesting Polar Flow mobile application is to current Polar Flow users and what elements needs to be in the application to fill the users' needs. The Polar Flow application is used by users who have a Polar wearable device so Polar Flow users' needs cannot be separated totally from the Polar wearable device users since many of the Polar ecosystem features can be found from both the Polar Flow service and from Polar wearable devices.

Another important purpose of this thesis is to find out how the current Polar users react to a new service concept for Polar Flow application. The concept used in this study is a visual sketch of the new Polar Flow app feature. The sketch is divided into different parts and is used as a tool for discussion with the current Flow service users. The sketch is kept simple for open discussion. The goal is to get insights on how users perceive the concept and the Flow service to improve the development of the Polar Flow application. The research question was set to understand what the current Polar Flow users want from the Polar Flow service. The research question is:

*What types of user needs Polar Flow users have?*

Researching the user needs of Polar Flow users will benefit iterating the concept presented in this thesis and the Polar service development in general.

The users can have different motivations to use the application so it is good to learn what are the reasons why they use the Polar Flow service because the users can have varied backgrounds, goals, problems and other reasoning to use the app for their needs. The company can market their products for specific target groups but those who are buying and using their products can belong to a different user group. It is good to learn what elements users wish it would have so that the user experience of the application can be designed to meet users' needs also in the future because the user experience of the app affects the overall customer experience as well. Thus, it is important to apply the user feedback to the design of the app to show the users that their feedback is listened to and that actions are taken to develop the service according to their needs. Is the app easy to use, is the data presented in an easy way to understand, is the app visually pleasing, does it show data users are interested in et cetera, are all questions that affect the user experience of the app. I will study these issues and answer the research question by conducting an online survey and interviewing current Polar Flow users.

Hassenzahl and Tractinsky have proposed that an interesting research question for UX researchers is to study how the overall quality of an interactive product is formed. This relates to understanding non-instrumental and underlying needs that users have when they engage with products. These needs are related to hedonic and pragmatic aspects of products. Hedonic aspects relate to human needs, for example stimulation like personal growth and identification like self-expression. Pragmatic aspects can be about for example if the product fulfils its behavioural goals. (Hassenzahl & Tractinsky 2006, 92–93.) In this thesis, I am studying the overall quality of Polar Flow application through the Mobile Application Rating Scale (MARS) tool that suggests that the app quality is formed by engagement, functionality, aesthetics and information. Conducting interviews is user as a tool to understand the underlying user needs.

#### **1.4 Thesis Structure**

The first chapter of the thesis presents the topic introduction in general, the Polar Electro Oy introduction as well as the research question and goals that have been set for the thesis. In the chapter 2 of this thesis, I am going to present relevant literature about previous research and the theoretical background for this study. The theoretical background includes theories

about user experience design, user interface design and graphical user interfaces and how user needs are defined.

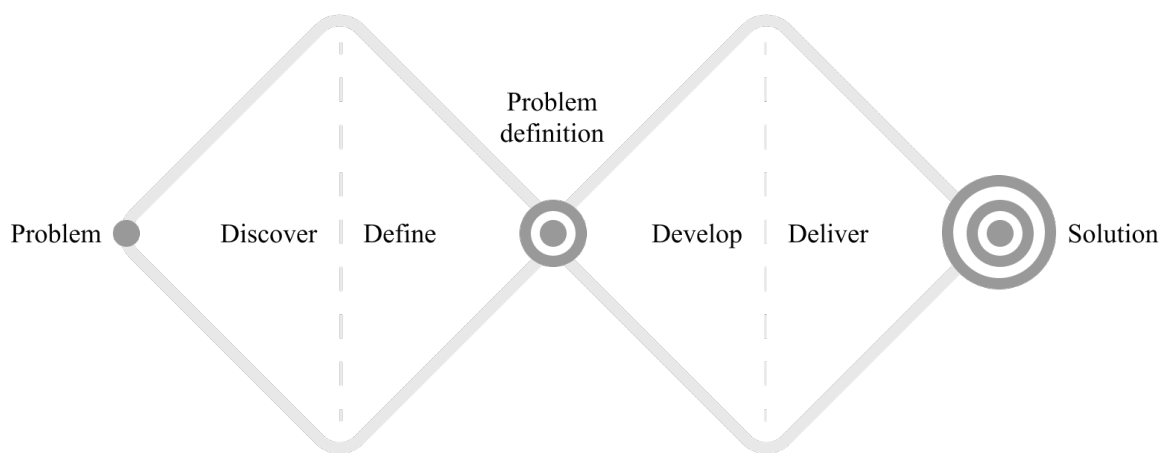
In chapter 3, I will present the research data and methods that includes the participants' background, usage of the MARS questionnaire for the online survey and the analysis methods. I will present the most relevant research results in chapters 4, 5 and 6. Chapter 4 focuses on results from the online survey. Chapters 5 and 6 focus on results from the semi-structured theme interviews. The design assignment is presented in chapter 7 telling the background of the topic for the design assignment, design process and relevant results from the interviews regarding the design topic. The final design proposals for Polar's service development are presented in chapter 8.

The presentation of the design proposals is followed by discussion in chapter 9 where I will present the summary of results, reflection and limitation as well as future research possibilities. This chapter is followed by conclusion in chapter 10. Literature references that were used are presented at the end of the thesis. Appendices include emails that were sent to participants as well as the survey and interview presentations.

The thesis structure follows the research process which started with defining the research questions and gathering previous research of the topic and forming the conceptual framework. The design concept was evaluated with users by conducting semi-structured theme interviews.

All design processes are linear in a way or another and the processes include a concepting phase that generates solutions for the original problem. One of the most popular design process is the Design Council's Double Diamond process. (Kettunen 2021, 125.) The process shows the steps in a design project. The first part of the process helps to understand the problem at hand. This part includes interacting with the people that are affected by the problem. After discovering the problem, the process continues with defining the problem. The second part of the process it about developing solutions to the problem seeking inspiration from multiple sources. Delivery is about testing the solutions and improving them. (Design Council 2025.) The Double Diamond process is visualized in figure 2.

The thesis follows the Double Diamond design process as it is shown in figure 2. The thesis focuses on discovering the users' needs by getting insights to what challenges, benefits, goals, preferences, expectations and wishes the Polar Flow users have. After discovering the hidden needs, the key issues are defined in the research results. This results in defining the problem so that possible solution ideas can be developed.



*Figure 2: The Double Diamond process. (Adapted from: Maula, H., & Maula, J. (2019). Design ja johtaminen. Alma Talent Oy, p. 188).*

On the second part of the Double Diamond process, the design proposals are created as potential solutions for Polar service development. For future development of the concept outside of the thesis scope, it can be decided which solution would fit Polar the best. Usability testing should be done for the preferred design concept to get further feedback from the users. Possible issues in design can then be iterated before handing the design to implementation teams.

## **2 UX DESIGN IN THE FIELD OF DESIGN RESEARCH**

In this chapter I will present how user experience (UX) design is defined and how it relates to user interface design (UI) design. The topic of user interface design touches on graphical user interfaces, human-computer interaction and what is the purpose of conducting research on interactive systems. Since this thesis is done in the Master's Program of Industrial Design, I will present how the definition of design has evolved and began to include interaction design.

### **2.1 User Experience Design**

The ISO 9241-210 defines user experience as user's impression on the use of a product. This impression includes emotions, behaviours and thoughts that arise while using a product. User experience represents for example brand image, system performance and interactive behaviour of a product. The user's background, skills and personality as well as the environment where the product is being used affect the experience the user will have. If user needs and anticipated expectations of the product are met, it results in satisfaction in the user experience. (International Organization for Standardization 2019). This can be seen that the user's feelings towards the use is crucial and knowledge on the subject matter.

User experience (UX) design focuses on the ideal experience the user gets from using a product or service and it aims to make the product user-friendly. This means that the product should be easy to use and useful to the user. Why users want to use a product is because they want value from it to their lives. UX process focuses on how the main content of a product is used by the target audience. UX design is mainly used in designing software applications. UX design should be included at the first phases of the design process to understand the users' needs and make the development of a product efficient. The UX design process includes research and collecting user data, analysing the data, defining the end goal, designing the product and getting user feedback from prototypes, final production and user testing. (Canziba 2018, 7–14.) In the last few decades, UX design has evolved from designing mobile and web applications to designing design systems (Ervast 2021, 95).

The UX design and research process includes several methods. During the discovery stage, it is important to validate assumptions and find out if the new feature is worth the effort to do it. During this stage, designers do field studies and interview users. Observation of the users in context is needed to design solutions for the problems. Being in contact with different stakeholders is also important to understand different requirements. Exploration stage is used for understanding user needs and the design scope. Common methods of this stage are to make interactive prototypes and test them on target users and brainstorm different solutions. Design solutions are checked during the testing stage to make sure that they work well for the target users. Usability testing is often done during this stage. Listening stage is used through the whole design process to look for problems. User surveys and collecting frequently asked questions are common methods. Different UX methods are designed for different goals and to obtain different types of insight on the matter. That's why it is good to alternate between different methods. (Nielsen Norman Group 2017.) One of the main goals in human-computer interaction research has been preventing users' dissatisfaction and frustration. This belief is shared by UX but it takes the perspective a step further by focusing on positive emotional outcomes like joy. (Hassenzahl & Tractinsky 2006, 93.)

Common UX design attributes include perceived aesthetics, usability, credibility and usefulness. Common persuasive features include self-monitoring, rewarding, cooperation, competition, social comparison and social learning. In addition to these six features, the overall perceived persuasiveness of the app is a persuasive feature. Out of the four common UX design attributes, perceived usefulness and perceived aesthetics have been found to have the biggest impact on users' receptiveness to the common persuasive features regarding fitness applications. In addition, perceived usability and perceived credibility have been found to have weak impact on users' receptiveness to the six common persuasive app features. Thus, it is suggested that designers should consider perceived usefulness and perceived aesthetics as important attributes in fitness app design. (Oyibo & Vassileva 2021, 1, 15.)

The perceived usefulness is a belief that the user can accomplish their fitness and health targets with the help of the fitness application. This UX design attribute is very important when the fitness application aims to change user's behaviour regarding their health. The

perceived aesthetics is a belief that the application is visually pleasing to the user. It is also an important design attribute of persuasive applications that aim changing user's behaviour. (Oyibo & Vassileva 2021, 16.)

It is crucial to understand what promotes continued use of health and fitness apps and the intentions of the users to understand the users' needs. Thus, we can design the apps better for the users. Users' intentions to continue using health and fitness apps are related to hedonic motivation and habits. Also, price value and performance expectancy are predictors of continuing usage of these apps. *The Extended Unified Theory of Acceptance and Use of Technology (UTAUT2) Model* is used to examine the behavioural intentions of the users and the usage of technology. The model takes into account effort expectancy, social influence and facilitating conditions in addition to motivation, performance expectancy, habits and price. All these aspects affect positively the intentions of continuing using health and fitness apps. (Kanthawala, Ma, Peng & Yuan 2015, 735.)

Hassenzahl and Tractinsky summarise that UX is about technology that fills the users needs beyond the instrumental needs. The user's encounter with technology is subjective and situated. This means that the product is used in a certain situation that creates the experience. UX is affected by the user's mindstate that includes for example motivation, mood and expectations, the product's characteristics like functionality and purpose and the environment where the product is being used. (Hassenzahl & Tractinsky 2006, 94–95.)

Additionally, Hassenzahl and Tractinsky propose that one of the main objectives for UX is to design for pleasure and create high quality experiences instead of designing only to prevent problems. (Hassenzahl & Tractinsky 2006, 95.) Hassenzahl has continued to evolve this statement to being that UX focuses on well-being as an outcome of UX instead of performance (Hassenzahl 2008, 15).

User testing is an important part of every step of the design process to ensure that the user experience is high-quality. User testing can be for example usability testing that aims to study how easy it is for users to perform specific tasks, how fast users can accomplish tasks, how easy it is to use the application again after the first time, what kind of errors occur

during the use of the product and how users are able to recover from them and how pleasant it is to use the product. Studying usability is important because if the product or service is difficult to use or the information is not clearly presented, people will not use it. Good usability matters because it can lead to higher amount of registered users and better results on key performance indicators (KPI) for the project. (Nielsen 2012.)

## **2.2 Graphical User Interfaces and User Interface Design**

User interacts with a product through a user interface. Typically, the user interface is a graphical user interface. It has graphical elements that the user interacts with by using a mouse, keyboard, touchscreen, voice recognition or gestures. The product can communicate the user about its state in various ways. These include for example visual and haptic feedback and changes in temperature. Many interfaces utilize multiple ways to communicate with the user which means that the interfaces are multimodal. (Häkkinen 2021, 41.) Generally, user interface (UI) design focuses more on the look of an application compared to UX design. UI design aims to make the product pleasing to use. (Canziba 2018, 8–9.)

GUI refers to graphical user interface. It has been typically a computer human interface on a computer. It is a way for computers and humans to communicate together. Graphical UIs aim to solve the problem of a blank screen that does not indicate to the user what they should be doing. GUIs usually have common characteristics that can be found from most of them like icons and menus. They consist of a windowing system that builds the icons and menus, imaging model that defines the graphics and an API that specifies how and when the graphics appear on the screen. (Jansen 1998, 22.)

Well-designed GUI makes an application easy and efficient to use and it has a big impact on the market success. Well-designed user interfaces are not only relating to the success of a single product, but the company's market success can depend on good design. For example, Apple's GUIs have been found to be exceptionally well designed by users, and it has increased Apple users' brand loyalty. It is widely believed that the Apple Macintosh has influenced the look and feel of all GUIs we use today, and it consists of the three main GUI characteristics. (Jansen 1998, 22–23.)

When designing GUIs, there are three main factors that should be considered. Those are the physical limitations for an eye to see visual details, limitations to how much information a person can process and The Gestalt Principle. It can cause tiredness for the eyes if the person needs to move their eyes across the screen since the eye can only focus on a small area at a time. (Jansen 1998, 23)

Futhermore, ergonomics in human-computer interaction (HCI) relate to the user interfaces being comfortable to use and that they work efficiently. The interface can provide for example haptic feedback like vibration on keyboard buttons in a mobile phone or vibration on a game controller. (International Design Foundation 2016b.) In addition, the ergonomics of user interfaces often relate to the observation distance and abilities of human's vision. These lead to considerations in font size, color and highlighting important information on the screen. (Chen 2024, 5-7.)

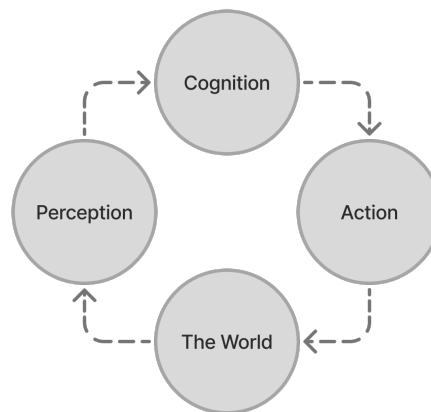
According to The Gestalt Principle, people organize data from top-down. It also states that people group similar items and information together. People expect that similar items can be found from the same group which results in a better locating for information on a screen. Similar items can be grouped together for example using colours. A well-designed graphical user interface can reduce the time it takes to complete a task and prevent errors from happening especially if the screen displays only the information the user needs to complete the task at hand. (Jansen 1998, 24.) The main goal of GUIs is to make the interaction between the system and human seamless. (Jansen 1998, 26).

Human-computer interaction focuses on interaction between humans and information technology. HCI became popular in the 1980s as computers started to become more common to be used in our every day lives at the offices and at people's homes. At the beginning of HCI, the focus was on improving the usability of desktop computers. HCI has since come far from that to focus more on the rise of smartphones, creating accessible products, educational and medical devices and even more complex interactions. Nowadays, the human-computer interaction is also closely linked to user experience design as UX designers can use the research findings from HCI to design products and services that condiser the empirical understanding of the people that would use the product. (International Design Foundation 2016b.)

Through the history, human-computer interaction research and evaluation methods have had a big focus on achieving behavioural goals during usability testing (Hassenzahl & Tractinsky 2006, 92). The aim for research on interactive systems is to find out how people use and interact with computers. It is not only about the aesthetics of the system. The research around HCI and input and output devices are about the ways the computer can communicate to the user and vice versa. This type of research aims to study the effects of implemented interactions and develop products that are designed to communicate well between the user and the product. The research can lead to a better understanding on how people interact with systems and different kinds of interaction techniques. (Jacob, Leggett, Myers & Pausch 1993, 70–71.)

Traditionally, inputs can be for example a keyboard. Nowadays, inputs can be about passive monitoring and sensing of the user. New output technologies include for example devices that are worn on the head and audio without speech. These new technologies like head-mounted displays require real-time response. (Jacob et al 1993, 73–76.)

If we look at HCI through computers and how we interact with them, there are inputs that lead to processing that produces outputs. Inputs can be for example typing on the keyboard or clicking on an icon with a mouse and this action leads to outputs. From psychological perspective, we sense the world around us and our brains process the things we see, hear and feel and that leads to outputs that are actions, for example speaking. It is important to notice that the actions can lead to perceptions as well so then the process becomes a loop. Humans have a natural instinct to do different things so it is important to focus on the actions also with digital interaction design. (International Design Foundation 2016b.) The loop of interaction is presented in figure 3.



*Figure 3: Interaction cycle. (Adapted from: Interaction Design Foundation, What is cognition in human computer interaction? <https://www.interaction-design.org/literature/topics/human-computer-interaction>)*

Interactive input and output differ from ordinary input and outputs. An interactive output device can be for example a sensor that sends continuously information about the software and its state of computation. Conventional output device sends information to user only when the software chooses to report the information. Conventional input is usually a task whereas an interactive input is a process that needs feedback. The user is typically in charge of the interactive input instead of the software which leads to an event-driven process. (Shaw 1986, 261.)

When interactive systems are smart tangible objects, the translation between input and output can be complicated. It can be harder for users to predict and understand these systems which can lead to poor user experience. (Van De Garde-Perik, Offermans, Van Boerdonk, Lenssen, Van Den Hoven 2013, 2.)

User interface design as a process includes creating user flows. It is a visual representation of the steps the user takes to complete a task. User flows help to understand how the user interacts with the product. They can be used for designing products and services. (Figma 2025.) The idea is to focus on meeting user's needs efficiently (Interaction Design Foundation 2024b). The focus on user flows is on a specific objective, for example a purchasing flow on a web store. It illustrates the steps that are needed to complete a specific task. It shows

the actions user takes and how the system responds. User flows do not show the emotions and thoughts the user has while interacting with the product. They can visualize wireflows, flow charts and task diagrams. (Kaplan 2023.)

Wireflows illustrate core app views and common user tasks. Typically, they are made of low-fidelity wireframes which are sketches of the layouts for mobile or web app pages. Wireflows can also be made from high-fidelity mock-ups. It is used for design specifications to illustrate user interactions. It works well for applications that have static pages where clicking an element leads to a new page. Wireflows do not illustrate well dynamic content. Wireflows offer a great tool for communicating with stakeholders like developers. (Laubheimer 2016.)

The communication between a system and a user is the key to improving interactive systems. There is a need for for the communication to be more natural between humans and computers. (Jacob et al 1993, 69.) Striving for meaning interaction means that designers aim to create systems that have clear actions and the feedback from the actions is easy to understand for the user. This helps users to get a good mental model which helps them to understand the relationship between the input and output mechanisms. (Van De Garde-Perik 2013, 2).

Product design has become a more crucial part for good and successful user interface design as The Internet of Things (IoT) and having sensors and screens in products have become more common (Häkkinä 2021, 41). Ervast suggests that in the future, AI will have a bigger role in making sure that user interface design meets accessibility criteria, iterating ideas for composition on a layout and creating navigation structures for user interfaces. This will free the designer's time for conducting more user research and user studies. (Ervast 2021, 95.)

### **2.3 How UX Design Relates to Industrial Design**

*The World Design Organization (WDO)*, formerly known as *The International Council of Societies of Industrial Design (ICSID)*, defined industrial designer in 1959 as a professional who has been trained to have both technical and visual knowledge to decide the materials and mechanisms used in an industrially manufactured product. This first definition of

industrial design puts an emphasis on mass production of objects for commercial use. Objects are produced in quantity and are not personal works of art. An industrial designer can also work with other areas of expertise if those need visual knowledge, for example in advertising and marketing. (World Design Organization 2024, A.)

After the mid 1960s, mass production started to switch to limited production. The target was not anymore that the products would serve and please everyone. (Koskinen 2011, 10.) User-centricity took a bigger step in industrial design in the 1990s. The ethos was that every individual has knowledge on some subject and can affect and inspire the design (Koskinen 2011, 18).

Today, *The World Design Organization* defines industrial design as a user-centric process that values creativity and understanding user needs to solve problems to build products and experiences that aim to increase the quality of life. Industrial designers use empathetic design methods to gain understanding of the users. They work as a link between a diverse set of professionals and business to co-create innovative products and create value for the users. The goal is that the design solutions result in a better product, service or experience. (World Design Organization 2024, B.)

The future of the industrial design term has been researched by the University of Lapland as part of the *Finnish Design Academy* project. Nowadays, the term industrial design covers many fields of design from service design to interaction design, user experience design and user interface design. Designers work in multidisciplinary teams in product development and often they need to have knowledge and understanding of technology and different fields. The skills that designers need in the future include skills related to problem solving, communication, user experience and user centricity. (Rytilahti & Kosonen 2021, 25–28.)

As a UX designer myself, I have noticed that designers need multiple skills like communication, rapid problem-solving skills, empathising with users and being able to create visually appealing layouts that help with communicating with different stakeholders. I have also noticed that the designer needs to understand how different technologies work like for example how Bluetooth connection works since wearable technology like smart

watches are often connected to the phone via Bluetooth connection. It does not hurt to be able to read or understand a bit of code as well to be able to communicate with the developers. Many of the design tasks can be like coding without doing the actual code because the designer needs to think how and when different elements are shown in the user interface and there can be multiple interactions happening simultaneously.

An industrial designer can have other professional title depending on the industry they work in and what kind of tasks their work includes (Rytilahti & Kosonen 2021, 36). The changes in designers' work have made the designers to be facilitators for co-operation inside the organisation. Design is about working in multidisciplinary teams where each member is valuable and dependent on each other. (Ervast 2021, 96, 99).

One of the main fundamentals of design is that the aim for design is to understand the problems and struggles users have in their daily lives so that it is possible to design solutions that make their lives easier (Rytilahti & Kosonen 2021, 32). The fundamental principles relate to all design work regardless of what is the interest of design. It does not matter if the designer is designing physical objects, services, processes or experiences. The main aim is to design things that have a positive impact on people's lives.

As the world has digitalised and technology has integrated into our lives, the designer's work has come to include interaction design. We interact with products utilising technology on many occasions during our everyday lives. We use technology to follow the news, keep in contact with our friends and family, study and work and use wearable technology in our daily lives. Some of these technological systems can be quite simple – requiring only one button – but some utilise multiple screens and buttons. Interaction design is about designing how interactive products are used, how different features are used and communicated to the user. It aims to make the interaction user-friendly and easy. (Häkkinen 2021, 39). Therefore, it is well justified that user experience and interaction design relates to the Degree Program of Industrial Design even though the thesis is not focusing on the design of physical objects.

### **3 RESEARCH DATA AND METHODS**

In this chapter, I will go through the methodological choices that were made for this thesis. I will present how the research materials and data that was gathered and used to deepen the understanding of Polar Flow users' needs. The study participants' background for both the interview and survey participants are presented. The Mobile Application Rating Scale (MARS) tool was used for forming the survey questions, and I will present how the questions were adapted to suit the purpose of this study. Lastly, I will go through the data analysis process that led to the research findings.

#### **3.1 Research Material and Data**

Qualitative research gives value to subjective experiences. This method is used to describe or explain the research topic. Descriptive research uses interview as a method to document how people who are living the phenomenon are experiencing it. Descriptive research is used to represent for example people, different groups and activities. (Leavy 2017, 5, 9.)

Quantitative research measures variables to bring to light patterns or correlations between the variables. The research results are presented as statistical data and aim towards objectivity. This method is used to explain or evaluate the research topic. Explanatory research provides insight on causal relationships and correlations as well as people's attitudes towards the research topic. (Leavy 2017, 5, 9.)

This study includes qualitative and quantitative research data. Mixed methods research integrates quantitative and qualitative data in the same study. Mixed methods research gives an extensive understanding of the research topic because it integrates both quantitative and qualitative research phases. This method is used to evaluate or describe the research topic. (Leavy 2017, 9.) The research data was collected this way to ensure that the user needs of the Polar Flow service would be investigated thoroughly.

I reached out to Lapland University of Applied sciences, University of Lapland, several sport clubs in Oulu as well as a Facebook group for people in Finland who are interested in endurance sports for leisure and competing to recruit participants for the research. The interviews and survey were conducted online because the suitable participants were living in different cities in Finland. Participants were given a consent form to sign to understand what they are participating in. Recording of interviews was kept only for the thesis work and deleted after the work is done.

The research material used in the thesis consists of interviews and survey data. I conducted semi structured theme interviews as qualitative data collection method and an online survey as quantitative data collection method to answer the research question. The survey was used to measure the user experience of the Polar Flow app. The interviews were used to validate the design concept and find out user needs surrounding it. The first part of the interview touched also on more general user needs and usage of the Flow -service. During the interviews, I showed parts of the concept to the participants and asked questions related to the concept. The interview participants commented on the parts and gave a rating of how interesting they found the concept to be.

Online surveys have become more popular during recent decades as a tool for data collection. Social media has helped researchers to conduct surveys and reach participants. It helps to collect data from a broad geographical area without causing major costs. It is fast to answer and submit the answer, but it may require research to find out how to reach the target audience. The survey should be easy to answer with different electronic and mobile devices. It is important to consider the length of the survey because it will affect how easy it is to answer. (Valli & Perkkilä 2018.) The online survey was kept short so that it would take at maximum 15 minutes for the participants to answer. Social media helped to recruit participants for this study.

Nowadays, Likert scale is typically used as a five-point scale so that the middle option is neutral. The description of the points should reflect the topic of interest. Often the points are about how strongly the participant agrees or disagrees with the presented statement. It is important to describe all points for the reliability of the study and so that the participants

express their opinion clearly. (Valli 2018.) The Likert scale was used for the ready-made answer options in the online survey so that it would be easy for participants to answer.

The disadvantage of the Likert scale is that participants may easily choose the middle neutral point or point two or four which are usually described as “somewhat disagree” and “somewhat agree” (Valli 2018). To prevent this, the middle option was also described in the survey so that it would not be completely neutral and would have a meaning. When we look at an example of the Likert scale question from the survey *Is navigating in the app easy and moving between screens logical?* the third answer point is described as “Navigation takes some time and causes some struggle” meaning that it is not completely neutral. The second and fourth points can be described as “somewhat disagree” and in this case “somewhat difficult” and “somewhat agree” and in this case “somewhat easy”. Ready-made answer options are typically used to ask about demographics and other background information of the target group. An option “other, what?” is often added to ensure that the participant can find the right answer for them. (Valli 2018.) If the option “other” did not suit the presented question, it was replaced with a statement starting with “more than” in this study.

The study proceeded as listed below:

1. Getting familiar with the research topic
2. Preparing the survey and materials shown during the interviews
3. Testing the interview structure with a coworker
4. Reaching out to different organizations to forward the survey
5. Conducting interviews
6. Transcribing interview data
7. Analyzing research material and data
8. Creating design proposals
9. Documenting the study

The first part of the interview was about the background of the participant. Questions related to participant’s age, occupation and sport background were asked. Next, participants were asked what’s their initial thought on the topic of the interview that is related to the design

concept. After that, the participants were shown pictures of the topic and more discussion about the topic was conducted. At the end of the interview, participants were asked to pick the most interesting parts of the concept and the least interesting parts of the concept if there were parts that inflicted feelings of interest or uninterest. Every participant was remembered with a small gift for their participation and time. The interview questions and structure as well as how long the interview would take were tested with coworkers and changed according to their comments. The interview was designed to last half an hour but one hour was reserved for each participant.

Both survey and interview participants were screened to be the current users of Polar products and Polar Flow app mobile application. All participants were also required to speak and understand Finnish because the survey and interviews were in Finnish. Participants were asked background information on their age, sex, and sports history. Participants were recruited from Finnish universities and from a Finnish Facebook group targeted for people from all fitness levels.

There are various suggestions on the number of participants for a user studies but research shows that 10–15 is usually enough. Even after a few users it is expected to start seeing patterns in how people interact with the product. Regardless of the number of participants, it is most likely that not all flaws of the design will be found. (Lazar 2015, 146.) I had 11 people participate in the interviews and four of them were male and six of them were female. The survey was answered by 96 people.

Interviews were conducted remotely via Microsoft Teams during two consecutive days. The online survey was done by Google Forms, and it was open for two weeks. The online survey was divided in parts following the MARS model and the six most persuasive features of fitness apps. The first part of the survey was about age, sex and sports background. The research questions included *“How would you describe yourself as a trainer?”*, *“How many times do you exercise during a week?”* and *“How many hours do you exercise a week?”*. These questions were meant to find out how active the users were, for example if they were training occasionally, regularly or intensively.

The next part asked about how long the user has been using Polar products and services and which Polar devices the user is using currently. These questions were asked to find out if the users are new users or more familiar with Polar. The questions on the second part of the survey were based on the MARS model and the six most common persuasive features of fitness mobile applications. The participants rated all features in a scale from 1–5. Answer 1 was strongly disagree or strongly dislike and answer 5 was strongly agree or strongly like.

The persuasive features were divided into two parts for this study. Self-tracking and setting goals were separated into two own questions because they can be identified as different features in fitness applications. The first part included self-tracking, setting goals, social learning and social comparison. The second part included questions about rewarding, competition and cooperation. The participants were asked what they think of those features and if they would be interested in them.

After asking about the persuasive features, the participants answered questions from the MARS model. The MARS model questions are divided into five topics: engagement, functionality, aesthetics, information and subjective quality. Some of the topics and the questions related to the topics were modified to suit Polar Flow app and to what Polar would like to know from the participants.

### **3.2 Participants' Background**

The research data was handled anonymously so that it is not possible to recognize participants personal information from their responses. All interview participants used the Flow service and most of them used the app version more than the web version. All of them owned and used a Polar sports or fitness watch. Most of the watches that interview participants used were from the Polar Vantage product series as can be seen from table 1. Five users reported using also a Polar H10 heart rate sensor for their trainings. All participants exercised regularly and more than 3 hours per week. Most common sports and exercises they engaged in included running, cycling, walking, stretching, yoga and going to the gym. More detailed sports and training background information is presented in table 1.

*Table 1: Interview participants' background information and which Polar products and services they are using.*

	<b>Sex &amp; Age</b>	<b>Profession</b>	<b>Sport and training background</b>	<b>Polar products and services in use</b>
<b>User 1 (U1)</b>	Female, 43	Office worker	Running 3 times/week. Uses a subscription training program.	Devices: Polar Grit X and Polar H10. Uses Polar Flow web more than Polar Flow app for inspecting trainings but uses app for syncing data to the Flow service.
<b>User 2 (U2)</b>	Male, 44	Office worker	Cycling and walking. Uses a subscription service for yoga and stretching. Trainings 3–4 h/week	Devices: Polar Unite.
<b>User 3 (U3)</b>	Female, 45	Healthcare worker	Running, walking, gym, yoga, stretching. Does 3–4 trainings/week	Devices: Polar Ignite.
<b>User 4 (U4)</b>	Male, 48	Office worker	Running, cycling, roller skating. Trainings 5–7 h/week	Devices: Polar Grit X.
<b>User 5 (U5)</b>	Male, 24	Healthcare student	Running, home workouts, gym, yoga, stretching, mobility exercises. High intensity training 1–2	Devices: Polar V2 and Polar H10.

			h/week. Other trainings 3–4 h/week.	
<b>User 6 (U6)</b>	Female, 21	Healthcare student	Skiing, running, indoor rowing and gym. Trainings 6h/week.	Devices: Polar M430 and Polar H10. Uses Polar Flow app daily.
<b>User 7 (U7)</b>	Female, 38	Social worker	Main sport is trail running. Other: strength training, walking, mobility training, cycling, indoor cycling and bouldering. Training 12h/week.	Devices: Polar Vantage V and uses Polar H10 for running and cycling. Uses Polar Flow web and Polar Flow app weekly.
<b>User 8 (U8)</b>	Female, 35	Healthcare worker	Main sport is triathlon. Other: gym and skiing. Training 10h/week, around 500h/year.	Devices: Polar Vantage V and uses Polar H10 on vigorous trainings. Uses Polar Flow app daily.
<b>User 9 (U9)</b>	Male, 50	Office worker	Running, orienteering. Does 3 trainings/week.	Devices: Polar M430, Polar Vantage V and Polar H7. Uses Polar Flow app weekly.
<b>User 10 (U10)</b>	Female, 47	Office worker	Gym, running, walking. Trainings 3h/week.	Devices: Polar Ignite. Uses mainly Polar Flow app but infrequently. Has used Polar Flow

				web for creating training targets.
<b>User 11 (U11)</b>	Female, 47	Literature teacher	Running, cycling, orienteering and skiing. Trainings 8–12 h/week.	Devices: Polar V800. Uses Polar Flow app after every training to inspect the training.

Altogether, 96 responses were received for the survey. All participants answered each question in the survey. The demographics of the survey participants are as follows. Most common age group was 18–25 years old as shown in table 2. That means 40.6% of people who answered. The percentage translates to 39 people out of 96 people. This is most likely because a lot of the participants were recruited from universities. Gender distribution of participants shows that most participants were female as 72 were female, 22 were male and two (2) chose the option for other.

Most users had used Polar products and services for more than a year. This means that most of the users were familiar with using these products. The data on participants' background shows that 40.6% of participants had been using Polar products and services for 1–3 years. In addition, 24% had been using Polar products for 4–6 years and 10.4% of participants had been using Polar products for more than 10 years. Thus, there were also well-established users among the participants.

*Table 2: Survey participants' background about gender, age and how long they have used Polar products and services.*

<b>Participants' characteristics</b>	<b>Number of respondents (%)</b>	<b>Number of cases (n)</b>
<b>Gender</b>		
Female	75	72
Male	22.9	22

Other	2.1	2
<b>Total</b>	100	96
<b>Age groups</b>		
Under 18 years	0	0
18–25 years	40.6	39
26–35 years	25	24
36–45 years	18.8	18
46–55 years	14.6	14
56–65 years	1	1
Over 65 years	0	0
<b>Total</b>	100	96
<b>How long they have used Polar products and services</b>		
Less than 1 month	4.2	4
2–5 months	5.2	5
6–12 months	9.4	9
1–3 years	40.6	39
4–6 years	24	23
7–9 years	6.3	6
+10 years	10.4	10
<b>Total</b>	100	96

Lastly, survey participants were asked about their sports and training background. Questions related to number of trainings and hours of trainings per week were asked. Table 3 shows that 42.7% of participants reported doing 3–4 trainings per week. Doing 5–6 trainings per week was reported by 26% of participants. On average, 31.3% reported exercising 3–5 hours per week. After that, 28.1% of participants reported exercising 5–7 hours per week. Only 2.1% reported that they do not exercise at all.

Participants were asked to describe their physical activity level from ready-made answer options. Most participants reported that they were training regularly. It is important to note that endurance sports were practiced by 20.8% of participants since Polar offers products for endurance sports and training, for example for running. Training a lot and doing different forms of exercise were common with 19.8% of participants. Participants did not include professional athletes.

It is shown in table 3 that there is a connection between how much the participants exercised per week and how they described their activity level. For example, 40.6% of participants described that they like to exercise regularly and there is almost the same number of participants who trained 3–4 times per week. There is also 3.1% of participants who exercised 0–1 hour per week and 3.1% of participants who said they were not exercising and not very active in their daily life. This shows that the participants were aware of their physical activity level.

*Table 3: Survey participants' sports and training background.*

<b>Sports and training background</b>	<b>Number of respondents (%)</b>	<b>Number of cases (n)</b>
<b>Amount of trainings/week</b>		
No exercise at all	2.1	2
1–2 sessions/week	17.7	17
3–4 sessions/week	42.7	41
5–6 sessions/week	26	25
More than 6 sessions/week	11.5	11
<b>Total</b>	100	96
<b>Hours of trainings/week</b>		
0–1 hours/week	3.1	3
1–3 hours/week	19.8	19
3–5 hours/week	31.3	30
5–7 hours/week	28.1	27
More than 8 hours/week	17.7	17
<b>Total</b>	100	96

<b>Self-assessment of physical activity</b>		
I do not exercise and I am not very active in my daily life	3.1	3
I am active in my daily life, but I do not exercise very often	15.6	15
I like to exercise regularly	40.6	39
I train a lot and do different forms of exercise	19.8	19
I practice endurance sports	20.8	20
I am a professional athlete	0	0
<b>Total</b>	100	96

### 3.3 Adaptation of The MARS Tool Questions and Answer Points

The Mobile App Rating Scale (MARS) assessment tool that has been developed in Queensland University of Technology was used as a base for the survey in this study. The tool has been developed for rating mobile health applications reliably and in an easy way for researchers. Additionally, it can be used during design and development phases as a list of items that need attention to provide high quality applications. The development of the tool included a multidisciplinary team that classified the app assessment criteria into categories. This team included interaction and interface designers. (Stoyanov, Hides, Kavanagh, Zelenko, Tjondronegoro, Mani 2015.)

The questions from MARS were adapted to fit Polar Flow service. From the section D (information), question about the accuracy of app description in the App store was changed to ask about if Polar Flow app reflects the participant's vision of a fitness application. This question was changed because the participant might not remember what the description in the App store is and thus might cause the participant to stop answering the survey. The question could have been too hard for participants to answer in the moment of filling the survey. Also question about the quantity of information was changed to how credible the participant thought the content inside Polar Flow app is. This was changed because Polar

Flow app contains a broad range of information already and it would be beneficial for Polar to know how the participants view the credibility of the information. The question about the app source was also changed because it says in many places in Polar Flow app that the application comes from Polar, so the source of the application is already very visible for the app users. The question about evidence base was removed because it could have been too hard for the participants to answer, and they could have answered whatever because they do not know the answer. Polar already has white papers on their website which explain the scientific background and base of the features Polar products and services offer.

From section E (app subjective quality) questions, question about how many times the participant would use the app withing the next 12 months had answer points about numbers of times for usage. These answer points were changed to for example “never”, “almost every day” and so on because those are easier to answer for the participant. Also, Polar Flow app gives feedback daily and the features in the application are something the user can use and look at every day if they want so changing the answer points to written answers instead of having numerical points was done.

The final section, “app-specific” section from the MARS model was not used because the questions were very broad. These questions could be more beneficial if the questions would be targeted towards specific features, for example sleep or recovery. Asking “*this app is likely to increase knowledge on health*” is too broad. A question like “*this app is likely to increase knowledge on sleep*” is a more targeted question on a specific feature that can be found from a fitness application. Thus, I recommend that Polar could use the app-specific questions in future research on specific features that need more user research. The survey made for this thesis was already quite long and the time limit for answering was set to be around 15 minutes at the most so that the survey would be user-friendly. Including this section would have made the survey longer and it would have taken more time to answer which can cause a loss in the amount of people who want to answer the survey.

### 3.4 Analysis Method

This thesis represents a mixed methods study that combines qualitative and quantitative data to provide answers to the research question (Hesse-Biber 2010, 16). Qualitative data can be consisting for example from interviews, images, audio files and texts. (Vuori 2021.) Before qualitative data can be analysed, the researcher gets familiar with the data and starts to code the data by organising it. This part includes transcribing audio files like interview material. (Ruusuvuori, Nikander, Hyvärinen 2010.) The researcher looks for interesting parts from the data. Those can be single words or full sentences. Typically, the researcher looks for interesting parts but also parts that interests him based on the theoretical background of the study. (Vuori 2021.)

After organising the data, the researcher concentrates on finding themes that rise from the data. The researcher is interested in the meanings that the participants give to the subject of the research and the similarities and differences and what those tell about the subject. (Ruusuvuori et al 2010.) The aim of the analysis is to describe the subject of the research (Vuori 2021). After the research findings are themed, they can be interpreted. After this, the findings can be compared to other studies' findings and related to theoretical discussions. (Ruusuvuori et al 2010.)

Quantitative data analysis can be done in various ways. One of the most common methods is calculating a mean score. It is the arithmetic average that is calculated from a group of numbers. Mean score is calculated by adding up all the scores and then dividing it by the number of scores. Calculating mean scores can be used for describing how the subject of research scored on certain things. The conclusion can be that the subject of the research scored well. Using mean score is a reliable way to illustrate central tendency. Though, it is sensitive to outlier scores that are much higher or lower than the rest of the scores. Median scores offer an alternative way to illustrate the central tendency. (Geher & Hall 2014, 6, 19-20.)

After gathering the research material and data, I transcribed all of the interviews. I used different colours to mark similarities in the transcribed files. I looked for interesting comments and ideas that the users had about the Polar Flow service, their use of Polar

products and the comments related to the design concept that was shown during the interviews. I looked for comments regarding their wishes, goals, desires and preferences to look for answers related to user needs regarding the Flow service.

The units of analysis were based on how user needs are defined. Units were challenges, benefits, goals, desires, preferences and expectations the participants had. I looked answers for what types of challenges the users face while using the app, what does the app help with, what is the benefit of using the app, what wished the users have regarding the app use, in what kind of situations the app is used, what the users like about the app, what is the reason the users use the app, what kind of information interest the users, is the app's content lacking and what kind of words the users use to describe the app. I looked for answers that would answer what kind of consequences there was based on their app use. These units were grouped to form entities and themes that rose from the research data. The results were interpreted to answer the research question regarding the user needs of Polar Flow service.

Survey analysis was done by calculating the mean score for every section of the survey to get the arithmetical average for each section of the survey. Also, analysis questions like *“How many think that the app is interesting to use?”*, *“How many think it is not interesting to use?”* and *“How often the app is used”* were asked when analyzing the survey data. The analysis included also looking into how easy the app is to use, how often users would use the app in the future, how many find the app easy to use and how many think the information is easy to understand as well as the opposite for these preferences.

Overall, this study aims form a comprehensive understanding behind the meanings that are related to user needs regarding Polar Flow service. The research findings are presented with meaningful citations that are combined to form themes that rose from the research data. The reasoning to use mixed methods is that is that it provides a deeper understanding on the research subject. Using mixed methods increases the credibility of the research results. (Hesse-Biber 2010, 16.)

## 9 DISCUSSION

In this chapter, I will present the most important research findings in the summary of results, reflections and limitations regarding the study and future research and design possibilities. The future work is be related to usability testing of the presented design proposals. In addition, I will present my thoughts on what it is like to design experiences related to wearable technology like sport and fitness watches and applications.

### 9.1 Summary of Results

The purpose of this thesis was to research and understand Polar Flow users' needs. The needs are related to what kind of content needs to be in the service so that it is interesting to the users and fills their needs. The thesis presents design proposals for the Polar Flow application that are based on the evaluation done with participants during the interviews. The topic of the design proposals came from Polar Electro's assignment as the company wanted to know how users would react to the Polar Flow app concept and what kind of user needs there are related to the topic of the concept. To find out the Polar Flow application users' needs, the research question was set to be:

*What types of user needs Polar Flow users have?*

The research results show that the user needs of Polar Flow users are related to self-tracking and self-monitoring. Tracking own data was a very motivational reason to use the app. Self-tracking was used to view and inspect training results and monitor overall wellbeing. Study participants were especially interested in their heart rate data from their trainings and from their sleep measurements. Users were interested in their heart rate variability during night and wanted to see overall structure of their sleep. Goal driven participants were especially interested in their heart rate data during trainings and looked at various statistics about their heart rate data. The sport the participants were passionate about related to what kind of features they were interested in the Flow service. For example, users who were passionate about running were interested in the Polar running index feature.

Overall, the app got good results from the MARS questionnaire in the online survey. This shows that current Polar Flow app users are content with the app experience and thus, the app does fill user needs of the Polar Flow users overall. This does not mean that there are no improvements ideas to be considered.

The user needs of Polar Flow users are not related to social learning and social comparison as these aspects of the application were not motivational at all for most participants. Most participants were also not interested in rewarding features like virtual scores in a mobile application. When we look at improvements, participants wished for better ability to compare and view their data both short and long term in the Polar Flow service as self-tracking was very important for them. The research findings suggest that the app also does not support user needs regarding customization of the application. Other wish that the study participants had, was that they wished for more personalized feedback from their trainings.

The interview results show that participants who reported struggling with recovering from their daily lives felt that they gained benefit from using Polar products for monitoring their wellbeing. These participants reported that they were analysing and interpreting their own data to see if they were for example getting sick. Very active participants did not report that they would have needed the Flow service for helping them to monitor their overall wellbeing.

The app was reported to be very easy to use by most users. The visuals of the app were average for most of the users which means that the app was not attractive but neither necessarily unpleasant looking. The app was corresponding to the users' perception of a fitness application. Over 93% of study participants would recommend the app to other people so the subjective quality of the app got very good ratings. From these results we can also see that the app must be filling the users' needs because it was very easy to use for them and they are willing to recommend the app to others.

## 9.2 Reflection and Limitations

In this section I will reflect the research. The significance of research results is primarily important for Polar Flow service development. This study utilised scientific methods for gathering and analysing research data. Participants' answers were handled anonymously and used only for this thesis. All parts of the study are documented in detail and supported by visual material, for example figures and tables. The study follows general scientific policies and honesty.

One of the reasonings to choose a mixed methods approach to research is that the detailed research findings can lead to future research possibilities by illustrating new research topics that rose from the study. This can lead to forming new research questions on the subject. (Hesse-Biber 2010, 18–20.) This study aimed to present detailed findings for Polar service development. The study also presents future design and research possibilities that are based on the research findings. Therefore, the study succeeded to meet the goals that were set and mixed methods approach worked well for the purposes of this thesis.

Combining qualitative and quantitative methods complement each other because using both methods cancels out the parts of the methods that are lacking. Quantitative methods can aim to provide a more generalised view on the research subject and qualitative methods can provide detailed information like the participants' perspectives on the research subject. (Hammersley & Richardson 1996, 170.) The methods used in this study complemented each other since the research findings give a comprehensive understanding on user needs of the Polar Flow service and shows the perspectives the study participants had regarding the Polar Flow service.

A way to prove the reliability of the research is to present how the research data is formed (Ruusuvaori et al 2010.) The research data used in this thesis is presented in detail and the background of participants is listed on tables. The study included 11 interview participants. The research findings started to repeat itself which shows that the number of participants was sufficient. The survey had 96 participants in the end. I reached out to multiple organisations to get participants. Altogether, the research materials and data gave a

comprehensive understanding on the user needs of Polar Flow service and deepened the knowledge on the topic.

The participants were voluntarily participating in the research, and they had the right to cancel their participation at any time. They were given instructions and information before the interviews about how to join the online meeting, what the interviews would be about and that their information would be used anonymously only for this thesis. All interview participants were remembered with a small gift from Polar for their time and effort.

It is no surprise that the training and heart rate data interests the users since Polar is known as a pioneer in the wearable industry and the heart rate tracking technology is backed by scientific research conducted by Polar. The company is highlighting it in their marketing that the heart rate tracking of their products is very precise and that the products are used by athletes. I suspect that this kind of marketing can be very interesting towards users who are interested in sports and training already but also for people who wish to start improving their physical performance.

There is more than the Polar Flow mobile application that affect the overall user experience of using Polar products and services. Those are the web service, industrial design of the wearables and the user experience of the wearables' operating system and user interface. The Polar Flow users are also users of the Polar wearables and Polar ecosystem, so the user experience of the Polar Flow applications is only one part that affects the users' satisfaction with Polar products. Even if the users are happy with the mobile application, if there is something that bothers them with their device, it can affect how they perceive Polar as a brand. The study focused on Polar Flow application which means that some of the research findings are very specific and cannot be generalized to represent other fitness applications' user experience. Therefore, the research findings are presented to evaluate only the Polar Flow mobile applications' user experience.

### 9.3 Future Research and Design Possibilities

The research did not include usability testing of the design proposals as it would have been too big task to design a prototype and test it with users on top of conducting interviews and survey to find out user needs. Future research possibility is to conduct usability testing on preferred design proposal. The usability testing can consider how easy the applications' user interface is to use by including tasks that the users need to complete. The test could be done in several ways. It could include testing only the Polar Flow application concept without the user having any wearable device on the test setup and building the tasks around using only the app or it could be about using the Polar Flow app concept together with a Polar wearable device. These different use cases could reveal how easy it is to use the application alone or with Polar wearable products.

User interface design uses research data that has been gathered through user testing and user research. New applications can be tested by creating prototypes of design possibilities. Interactive prototypes can be tested in the field in real-life settings. The aim for user research is to gain user insights that can be used to design new solutions. The research findings can help to reduce errors and improve the usability of the user interface. User research creates value for both product development and business. (Häkkinen 2021, 42–43.)

Typically, usability testing includes users completing specific tasks with the product. The designer observes how the users interact with the product and if they succeed with the tasks and if they face problems while using the product. The designer cannot help the users with the tasks. To gain knowledge on the biggest usability problems, it is usually enough to test the design with five participants. The usability should be done before having a completely implemented design because it can be hard to change the app's structural problems afterwards. (Nielsen 2012.)

A closed beta testing can be run with Polar users after the service has been designed, tested with users and developed. After the beta testing, it should be measured how the customers react to the product to see if it should be improved even further. This could include finding out if the users would like that the app offers better communication about the new design. Any architectural problems should be issued before this step.

The study was conducted in Finland so another possibility could be to test the design concept with international audience to see if the concept would be attractive to users outside of Finland and see if there would be differences in user needs. All of the participants were current users of Polar Flow application and familiar with the products so the design concept could also be tested with potential new Polar users to see if they would be interested to use Polar products and services because of what the concept offers.

The interview and survey participants demographics varied with age and sports and training background so the study could also be done with a narrower target group with a certain age group or with a specific user group that have defined sport and training background like occasional trainers, regular trainers, strength trainers or endurance athletes.

#### **9.4 Designing for an Experience**

Experiential perspective of UX states that an experience is a combination of different elements like the user's mental state and the product, and these elements interact with each other. This process has a beginning and an end which results in an outcome that is the experience. Experiences have bigger impact on wellbeing than material outcomes, so it is suggested that it is better to focus on experiential outcomes rather than material outcomes in interactive products. (Hassenzahl & Tractinsky 2006, 94.) This highlights the importance of utilising UX in a company that produces interactive products. In addition, this suggestion gives a clear guideline that Polar can also focus on.

Different perspectives on UX raise questions on what is possible to design. For example, it is not clear if it is possible to design a specific experience or design for specific emotions in mind. Do designers have abilities to control specific elements to guarantee that the experience will turn out to be positive or are we rather designing for an experience and keeping in mind experiential aspects without being able to guarantee that the experience will be positive? (Hassenzahl & Tractinsky 2006, 95.) With subject of wearables and fitness applications, I believe that as a designer, we are designing for an experience. The experience can be for example seeing relevant data like heart rate information during a training session or being able to view long term data to track progress while preparing for a competition.

These experiences have a clear beginning and an end. We do our best to ensure that the experience will be positive for users by conducting usability and user testing, collecting feedback, empathizing with users, following the market and global trends but we cannot control all elements that will affect the experience, especially those elements that are related to the environment where the product is being used. With wearables, the environment where the product is used can be very challenging and different, ranging from swimming indoors to extreme outdoor conditions. I would not reject the other perspective completely since I do believe that designers can have quite strong control over designing certain elements. I believe that those elements are typically related to the aesthetic aspects of products by following modern trends, what is in fashion and favored by the users and by using their creative and artistic skills.

Furthermore, I believe that the design is highly situational for wearables and fitness apps because the users want to use their wearables or apps for specific situations and needs. For example, they want to be able to do something for their personal goals, daily life or to monitor their personal health problem and use the product in a situation that they benefit from using it. They might want to see their data because they feel like something can be seen from it that they are experiencing and feeling. Also, usually people use their phone in a certain situation to do or see something they need to do or need the knowledge for being able to do something or to make decisions or be encouraged to do something. You use an app for specific tasks or specific reasons though it can also be just for entertainment. Nowadays, smartphones are packed with apps and single apps are not designed to be used for everything and have all the functions that a person might need from their phone. Each app serves their own purpose and have specific cases what they can be used for. For example, a fitness application is not used for daily communication and text messaging with family members and friends.

## 10 CONCLUSION

This research focused on Polar Flow app users' needs and creating design proposals for Polar Flow service development. The Polar Flow service consists of a mobile application and a web service that are used together with Polar's wearable technology like sport and fitness watches and heart rate sensors. This research is focusing on the mobile application part of the Flow service. User needs of Polar Flow app users were researched by conducting semi-structured theme interviews and an online survey. The goal of the research was to define what types of user needs the Polar Flow users have.

The goal for the research was to get a deeper understanding of Polar Flow users wishes, preferences, goals and struggles related to the use of Polar Flow service. The research findings of this study provide insights into user experience in the context of mobile applications that are used with wearable technology. This study shows that user experience is affected by multiple factors and good user experience creates value for end-users but also for businesses. Therefore, it is important to understand how user experience is formed.

Research data gathered from eleven interviews was analyzed by transcribing the interview files, coding and finding similarities in the data so that interpretations could be made. The time for each interview was reserved to be at the most an hour. The units of analysis were defined by using the definition for user needs. At the end of the analysis, the units were grouped to form entities. Research data gathered from the online survey was analyzed by calculating mean score for each section of the MARS questionnaire. Also, analysis questions including how easy the app is to use, how often the app is used and how interesting the app is were looked at when analyzing the research data.

The research results from the online survey are presented in detail to give a better understanding of the engagement, functionality, aesthetics, information, app quality app and app subjective quality of the Polar Flow mobile application. The research results from the interview present attitudes and user needs that the research participants had towards the Flow service. The research findings were compared to previous research about the topic of wearable technology and fitness and health monitoring applications.

The research results show that the user needs of Polar Flow users are related to self-tracking and self-monitoring. The users are very interested in their heart rate data that is gathered with their Polar device for example during exercise and sleep. Overall, the Polar Flow app fulfills the users' needs. The research results present further development suggestions so that Polar can take the service development even more towards user centric direction. It is important to utilize design methods early in the development process to ensure that the product meets users' needs.

This research findings are formed to practical implications that are presented in the design proposals. The design proposals are provided so that the quality of Polar Flow app's user experience can be enhanced. Future research possibilities include conducting usability testing on the preferred design proposals. The user experience and user interface design can be iterated based on research findings from usability testing before it is handed over to implementation teams.

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**12 APPENDICES**

APPENDIX 1	Email invitation to recruit participants
APPENDIX 2	Email response to interview participants
APPENDIX 3	Presentation of the survey
APPENDIX 4	Presentation of the interview

## APPENDIX 1

Hei,

Olen Kaisa Maljanen Polarilta ja etsin Polarin tuotteiden ja Flow -mobiilisovelluksen nykyisiä käyttäjiä osallistujiksi käyttäjäkyselyyn sekä haastatteluihin. Sama henkilö voi osallistua sekä kyselyyn että haastatteluun.

Käyttäjäkysely ja haastattelut tehdään pro gradu -tutkielmaani varten. Teen tutkielmaa Lapin yliopiston teollisen muotoilun koulutusohjelmassa. Tutkielma käsittelee Polarin Flow -mobiilisovellusta ja sen mielenkiintoisuutta Polarin käyttäjille.

Osallistujia etsitään sekä kyselyyn että haastatteluun erilaisista liikuntataustoista. Kyselyyn vastanneiden ja yhteystietonsa jättäneiden kesken arvotaan Polar Ignite 2 -fitnesskello. Kyselyyn voi vastata 30.11. asti.

Kyselyyn pääset tästä linkistä:

**Haastattelut toteutetaan 29.-30.11 klo. 8.00–20.00 välillä.** Haastattelu kestää noin tunnin. Haastatteluun voi osallistua paikan päällä Oulussa Lapland Hotelsilla (Kirkkokatu 3) tai etänä Microsoft Teams:n kautta. Haastatteluun osallistuneet muistetaan vaivannäöstä. Voit ilmoittautua mukaan tästä linkistä:

Ystävällisin terveisin,

Kaisa Maljanen

kaisa.maljanen@polar.com



**APPENDIX 2**

Hei,

Haastattelupäivät lähenevät ja laitan sen tiimoilta vielä pari asiaa.

Ohessa on liitteenä Teams -ohje, johon voit tutustua, jos Teams ei ole sinulle entuudestaan tuttu. Ohjeesta löydät tiedot, miten Teams -kokoukseen liitytään ja mistä omat mikrofonit ja kamera-asetukset löytyy.

Muistathan käydä kirjoittamassa salassapitosopimuksen (NDA) ennen haastattelua. Sopimuksen allekirjoittaminen vaaditaan kaikilta haastatteluun osallistuvilta ja on ehto haastatteluun osallistumiselle.

Muista varmistaa, että sinulla on toimiva kuulokemikrofoni haastattelua varten. Ääni voi alkaa kiertämään ilman kuulokkeita.

Jos et pääse Teams -tilaan haastattelupäivänä, voit ottaa minuun yhteyttä:

kaisa.maljanen@polar.com

Mukavaa viikonloppua!

Ystävällisin terveisin,

Kaisa Maljanen

### APPENDIX 3

Osallistu käyttäjäkyselyyn ja voita Polar Ignite 2 -fitnesskello!

Hei! Olen Kaisa Maljanen ja olen tekemässä Pro Gradu -tutkielmaa Polarille. Opiskelen teollista muotoilua Lapin yliopistossa.

Tämän kyselyn tarkoituksena on kartoittaa Polarin nykyisten käyttäjien kokemusta Polar Flow -mobiilisovelluksesta. Kyselyyn voi vastata, jos asut Suomessa, käytät tällä hetkellä jotakin Polarin laitetta ja Polarin Flow -mobiilisovellusta. Kyselyyn haetaan vastaajia useista eri liikuntataustoista.

Kyselyn ensimmäisessä osassa vastataan taustatietoihin. Taustatietoja tiedustellaan vastausten tilastollista käsittelyä varten. Kyselyn toisessa osassa vastataan käyttäjäkokemukseen vaikuttavista tekijöistä ja niitä arvioidaan asteikolla 1–5. Kyselyn vastaukset kerätään anonyymisti ja kyselyyn osallistujia ei voida tunnistaa vastauksista. Kyselyn tuloksia käytetään vain Pro Gradu -tutkielmaa varten.

Vastaamiseen menee noin 10–15 minuuttia. Vastausaikaa on 30.11. asti.

Kyselyyn vastanneiden ja yhteystietojensa jättäneiden kesken arvotaan Polar Ignite 2 -fitnesskello. Jos haluat osallistua arvontaan, jätä sähköpostiosoitteesi kyselyn lopussa. Arvonnan voittajalle ilmoitetaan henkilökohtaisesti 2.12. mennessä.

Kiitos osallistumisesta!

Tarvittaessa voit ottaa yhteyttä: [kaisa.maljanen@polar.com](mailto:kaisa.maljanen@polar.com)

## APPENDIX 4

Hei, kiva että pääsit tulemaan! Voit kertoa, että olet ollut Polarin haastattelussa, mutta et yksityiskohtia.

Minä olen Kaisa Maljanen ja vedän tätä haastattelua. Haluaisimme myös tallentaa session, jos se on sinun puolestasi OK. Tallenteita käytetään vain ja ainoastaan haastatteluiden purkamiseen meidän muistin tueksi. Voit halutessasi laittaa kameran pois päältä tallentamisen ajaksi, jos et halua, että kuvasi näkyy.

Haastatteluun on varattu aikaa noin tunti. Voit ihan rauhassa kertoa ajatuksesi.

Tässä haastattelussa on tarkoitus käydä läpi erästä Polarin mobiilisovelluksen eli Polar Flow -sovelluksen uutta ominaisuutta. Haastattelun aikana esitän sinulle kuvallisen luonnoksen uudesta ominaisuudesta ja esitän siihen liittyen kysymyksiä. Tarkoituksena ei ole testata sitä, miten hyvin sinä suoriudut haastattelusta, vaan tarkoituksena on tutkia luonnosta uudesta ominaisuudesta. Eli en arvioi sinua, vaan Polarin omaa palvelua! Kysyn haastattelun alussa myös esitietoja esimerkiksi liikuntataustastasi ja urheilu- ja hyvinvointilaitteiden ja sovellusten kokemuksistasi.

Toivomme että vastaat esittämiimme kysymyksiin täysin rehellisesti ja kainostelematta. Tärkeää on, että ajattelet ääneen ja kerrot ajatuksesi ääneen. Sinun ei tarvitse pelätä, että loukkaisit minua mielipiteilläsi, koska olen tutkijana tekemässä tätä haastattelua.

Tämä haastattelu suoritetaan luonnoksella, jossa ei ole mitään oikeita ominaisuuksia. Voi siis esiintyä epäloogisuuksia.

Onko sinulla jotakin kysyttävää?