Studying and designing the incorporation of gamification into a menstrual cycle tracking application in collaboration with a game company

University of Oulu
Faculty of Information Technology and Electrical Engineering
Information Processing Science
Master's Thesis
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2023

Abstract

This thesis focuses on two topics of study. The first part will cover a study focused on exploring the needs and expectations game development businesses have for university collaboration. As part of this it will be investigated what kind of experience and knowledge game development businesses look for in students. Secondly, the thesis will look into utilizing gamification as a way of improving menstrual cycle tracking applications. Materials for these studies have been gathered during a research internship at the INTERACT research unit. The research methods utilized comprise of a literature review and qualitative research. This study was motivated by the traineeship at INTERACT, and by participation in a gamification project through Ikune Ltd.

The first study consisted of reaching out to game development companies in Finland and conducting semi-structured interviews with them. The study had one respondent but nevertheless provided useful results. Students should have practical knowledge of programming languages, enthusiasm towards the company's projects, and a portfolio showcasing their skills. Companies can benefit from collaboration by scouting the talent of students, networking with the university and students, and potentially utilizing student resources to prototype ideas.

The second study consisted of practical user interface prototype design, along with a user study investigating gamification and the participants perspective of the topic in menstrual cycle tracking applications. Participants were limited to two due to schedule constraints. This study still provided useful results, with many of them agreeing with earlier literature. As an interesting new finding, participants were not opposed to unusual experimental features when they seemed like medical tools or interventions. A list of important considerations for future application development was collated, with the ability to customize both the appearance and functionality of the application being among the most key findings.

The findings of the first study are useful to a multitude of groups, namely university students, companies considering university collaboration, persons interested in working in the game development industry, and possibly universities if they want to provide courses more directly related to game development. The study offers students relevant skills they should learn if they aim to work in the game development industry. Likewise, the study offers companies with what they could stand to gain from collaboration with universities and students. The second study is more contained, ultimately providing a list of application design considerations for gamified menstrual cycle tracking applications. These findings should be useful for future application developers and possibly for academia for the sake of future research into the topic.

Keywords
Gamification, self-tracking, healthcare, menstrual cycle, tracking applications

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MSc, PhD Student, Juho Mattila

Foreword

Work on my thesis began before the summer of 2022. I had been thinking of possible topics for my thesis, things that interest me, and potential ways to find an interesting thesis topic. I wanted to try and combine my thesis writing with the possibility to at least introduce myself to a company, getting to know some people in it and forming some connections with them. The goal here was to try and have a company that might be interested in hiring me right away as I graduate. This led to a plan to contact game development companies. My bachelor's thesis (Vuolukka, 2020) focused on investigating the impact procedural generation has on the replayability of video games and I had completed a couple courses related to Virtual Reality (VR) game design, so I felt I had some tangible merits to approach these companies with. I've also been into various kinds of games for a long time with an interest in game design.

Ultimately this plan did not go through as the INTERACT Research Unit advertised it was looking for research trainees. INTERACT is a Research Unit at the University of Oulu that focuses on research into Human Computer Interaction (HCI). My to-be thesis supervisor also happened to contact me regarding my thesis and how it was progressing as I had filled out a form some time earlier stating I might need some guidance on starting my thesis. Leena Arhippainen just so happened to work at the INTERACT research unit, and after some discussion and planning she put out an advertisement for research training under her supervision, with the intent that I would apply for it. I applied for this position and got it. The plan was to complete the research traineeship from a topic that could be continued into a master's thesis.

During the early stages of traineeship, I had a goal of contacting companies in the game development industry and inquiring about their needs and interests for research collaboration. Background research was done for this contact process, finding potential collaboration companies, and laying out a timetable. Weight was given to the location of the company, favouring ones operating locally or at least in Finland. Some companies outside of Finland were also included. Interview questions were also prepared for the initial company mapping. A virtual company visit with Ikune Ltd (Ikune Labs, n.d.) was also planned into the traineeship. Ikune Ltd works virtually, with its employees working from various physical locations. Due to this most of our collaboration meetings were held remotely. During our physical meetings I first met CEO Juho Mattila in an initial meeting discussing potential research collaboration. Later I met both, Mattila and CTO Jarkko Tuovinen, they are also the co-founders of Ikune Ltd. Each of these meetings happened at the University of Oulu.

I would like to thank the INTERACT Research Unit and the Faculty of Information Technology and Electrical Engineering for the awarded personal scholarship and for supporting my master's degree studies by helping complete the Work Experience in ICT responsibilities (5cr) course. I would also like to thank Janne Mourujärvi and Samia Islam who were also research trainees at INTERACT during my time there for our cooperation and interesting discussions.

The work done with Ikune Ltd, and its co-founders Juho Mattila and Jarkko Tuovinen ended up being key parts of this study and thesis. Therefore, I want to thank both Mattila and Tuovinen for our extended collaboration during my traineeship and after it. Working with Ikune was very interesting, useful, educational, and a good experience all-round and I hope collaboration will continue in new ways after the completion of my thesis. In addition to Ikune I would also like to thank a third-party company for the possibility to

work on their project. Work done together with Ikune, and the third-party company contributed immensely towards this thesis.

I would also like to thank the people who participated in this study. Thanks to your time and willingness to partake in this study, it became a reality. You provided immensely useful input and helped this study forward by leaps and bounds.

I also want to thank my friends and family for supporting me during my university career in general. While these people may not have directly influenced the materialization and completion of this thesis, they have helped me keep going during my many years at the university. It is somewhat surreal to believe six years have passed since I first step foot in the university of Oulu and began my studies. These years have been filled with many twists and turns, new experiences and old traditions, ups and downs, headaches and laughs, but my most loyal friends and family have always been there. Thank you everyone.

Last but certainly not least a massive thank you to my thesis supervisor, Leena Arhippainen, for her guidance, valuable feedback and insights, and many interesting discussion sessions around this study. In some ways it was her that got me really thinking about my thesis and got me motivated to start this whole process. I had already had plans for the sort of thesis I would like to create but Leena truly helped turn these plans and visions into practical steps and a finished outcome. An additional thank you to Juho Mattila for later joining this thesis process as a second supervisor. Thank you to the reviewers of this thesis, Leena Arhippainen and Jouni Lappalainen. Thank you to Jouni for his comments helping finalize the thesis.

Oulu, 1.6.2023

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Abbreviations

AR	Augmented Reality
ARG	Alternate Reality Game
CEO	Chief Executive Officer
CTO	Chief Technical Officer
EXP	Experience Point
FAQ	Frequently Asked Questions
FPS	First-person shooter
GPS	Global Positioning System
HCI	Human Computer Interaction
NDA	Non-Disclosure Agreement
OGL	Oulu Game Lab
Q-Selfer	Quantified Selfer, people part of the Quantified Self movement
RFID	Radio-frequency identification
SDT	Self-Determination Theory
UI	User Interface
UX	User Experience
VR	Virtual Reality

Contents

1. Introduction

Using applications to track information about oneself has become increasingly popular and widespread (Sarkar, Gourler, Lyles, Tieu, Clarity, Newmark, Singh & Bates, 2016). People track multiple types of information, such as sleep, exercise, steps, diet, and so on, with dieting and fitness being the most common types of tracking (Aitken & Lyle, 2015).

A popular example of an automated tracking solution is the Oura ring (Oura Health, n.d.). Users wear the Oura ring, and it collects data about their sleep, blood oxygen saturation, physical activity, heartrate, and body temperature. Oura combines the physical ring with a smartphone app that collates the information and displays it to the user. The Oura application makes recommendations to the user based on the collected information. It also offers some additional information such as regarding the users' menstrual cycle, that it has inferred based on changes in the users' body temperature. (Oura Health, n.d.)

Data collected by these tracking applications can also be used for several other purposes, such as predicting a woman's probability of becoming pregnant (Liu, Shi, Wu, Thomas, Symul, Pierson & Leskovec, 2019). These tracking applications are however not without their problems. They can for example fail to provide meaningful and actionable feedback to the users and leave users on their own in deciphering graphs and deciding what actions to take (Karkar, Fogarty, Kientz, Munson, Vilardaga, & Zia, 2015). Karkar et al. (2015) aimed to reduce the burden and uncertainty in self-tracking and to find a way to provide greater certainty and value to the user in results. Choe, Lee, Lee, Pratt, and Kientz (2014) introduce three common pitfalls which included tracking too much and too many things, not tracking the necessary triggers and context, and a lack of scientific rigor leading to dubious conclusions. Other barriers cited by Choe et al. (2014) include lack of time, insufficient motivation, poor visualisation and analytics tools, poor data analytics skills, and data being scattered across multiple platforms.

1.1 Background and motivation

The industry and spread of video games has grown massively in the last few decades. It is almost exactly 30 years since the release of some games that really brought video games more to the mainstream and defined them as a phenomenon. Games such as Doom (id Software, 1993), released in 1993, really served as one of the initial first-person shooter (FPS) games, helping start the genre. Other notable games include the Age of Empires franchise, first started in 1997, and the Civilization game series, with the first game released in 1991. Games and more notably game-like features are expanding into other areas as well, such as education in the form of serious games. As another new expansion game-like features have been separated from games and implemented into non-game contexts through gamification. Gamification has become a key part of many modern applications including topics such as education and healthcare. A good example is Duolingo (Duolingo, n.d.), a very popular language learning application that utilizes gamification. A personal interest into video games, human motivation, and the game development industry played a role in the topic of this study and the contents of the traineeship at INTERACT.

The topic of this thesis started to find its shape with the help of the early phases of the traineeship and a literature review into the game design field. It was important that the topic of this thesis covered both, the research questions related to the research visit and the design and development work done during it. During the research visit to Ikune Ltd. tasks included User Interface (UI) design, designing gamified mechanics, and work on a

literature review and documentation of Ikune's gamification project. The research questions and studies are connected by the time spent at INTERACT. Work was done, and materials gathered in order to answer both research questions and work on both parts of the study during the traineeship at INTERACT. During the early parts of the traineeship, work focused on study I and RQ1, while during the later parts focus shifted more on study II and RQ2.

The main goal during the research visit to Ikune, was to help improve user retention of an application Ikune's customer was developing. The customer's goal was to have users actively use their application for six months and gamification was meant to help with this. The product is a mobile application focused on helping identify endometriosis faster. The applications main user group is those living with endometriosis and people not yet diagnosed but suffering from symptoms. Six months active application use was the goal, as the customer believe they could identify endometriosis in this timeframe.

Described briefly, endometriosis is the growth of endometrium (the innermost lining of the uterus) abnormally outside the uterine cavity or myometrium (middle layer of the uterine wall). Treatment generally focuses either on drug treatment, surgical treatment, or a combination of these approaches. Typical symptoms of endometriosis are pelvic pain and infertility. (Olive & Pritts, 2001)

Successfully diagnosing endometriosis in only six months would serve as a remarkable development. According to a study published in 1996, the median delay from symptoms to endometriosis diagnosis took seven and a half years (Hadfield, Mardon, Barlow, & Kennedy, 1996). Another, more recent study however showed promising improvements, with the delay on diagnosis on average being reduced to two to four years (Santos, Pereira, Lopes, & Depes, 2012). Even if the goal of six months was not met, clear improvements in this field could still be accomplished.

1.2 Research questions and method

The first objective of this study is to explore what sort of research and development collaboration needs businesses in the game development industry might have with universities and their students. The second objective is to investigate how gamification could be utilized in health applications intended for menstrual cycle tracking. These research objectives can be divided into the following research questions:

1) What sort of collaboration needs and wishes do game development companies have for university students?

2) What are important considerations in designing menstrual cycle self-tracking applications?

Answers to RQ1 will be sought through qualitative research (Fossey, Harvey, McDermott, & Davidson, 2002), consisting of a semi-structured interview (Game Company Study 1). RQ2 will be answered through literature review and qualitative research. UI design concepts will be created in the study in a user-driven fashion. These designs will be evaluated with the help of potential users through a user study containing semi-structured interviews (Game Company Study II; Fossey et al., 2002). Semi-structured interviews were chosen as they allowed for a focused interview, while still allowing the exploration of ideas and topics that come up during the interview (Adeoye-Olatunde & Olenik, 2021). This was considered important for both studies I and II, as being open-ended allowed for much more diverse answers from the participants.

1.3 Scope and focus of the thesis

The main focus of this thesis is on gamification. Related topics such as serious games will be covered in the literature review, but they are outside of the main scope of this study. The differences and similarities between gamification and serious games will be explored for a better understanding of gamification.

Game Company Study II will focus on applications focused on tracking and managing the menstrual cycle. Applications that are otherwise related to health will be covered briefly but the main focus will be on applications and design solutions related to tracking the menstrual cycle.

Developing a new piece of software will be considered out of scope for this study but could serve as a possible field of future research. Designing new UI prototypes following the recommendations made by the discoveries of this study will also be considered out of scope of this thesis.

1.4 Structure of the thesis

The thesis is laid out as follows: in chapter 2 the related work will be discussed. In chapter 3 Game Company Study I is discussed, describing the process of contacting businesses and the organizing of the related interview. Chapter 4 will cover Game Company Study II, reporting on a research visit during the summer of 2022 and user study that was conducted during this visit. Chapter 5 will showcase the results and present answers to the research questions posed earlier along with discussion of the findings. Finally, chapter 6 will serve as a conclusion to this thesis.

2. Related work

This chapter is going to cover prior work related to the topic of the thesis. The purpose of this section is to lay out the groundwork and to provide an overview of relevant existing literature. Three main subjects will be covered in this chapter. First, works related to gamification will be introduced, along with an introduction to the term. Serious games will be discussed second, an important subset of gamification. Finally, motivation, the Quantified Self movement as described by Choe et al. (2014), and the connection between gamification and motivation will be discussed.

2.1 Gamification

At its core gamification refers to designing systems, services, or processes in such a way that they provide game-like positive, engaging experiences (Hassan, Morschheuser, Alexan, & Hamari, 2018). This definition of gamification is also supported by Huotari and Hamari (2017) as they state gamification to be a "…*design approach of employing game elements into different types of systems and services, with the goal of affording gameful experiences*." Deterding, Dixon, Khaled, and Nacke (2011a) define gamification to be "...*the use of game design elements in non-game contexts*." Seaborn and Fels (2015) propose a similar definition, stating that gamification in general describes features of an interactive system that aims to motivate and engage users through the use of game elements and mechanics. Kosmides, Demestichas, Adamopoulou, Koutsouris, Oikonomidis, and De Luca (2018) cite Petkov and Rogers (2011) and state that gamification attempts to achieve behaviour change by creating an entertaining and engaging experience using the elements of a game or contest. Deterding, Khaled, Nacke, and Dixon (2011b) suggest defining gamification as the use of game design elements in non-game contexts. Kapp (2012, p.10) uses a similar definition: "*Gamification is using game-based mechanics, aesthetics and game thinking to engage people, motivate action, promote learning, and solve problems*."

Deterding et al. (2011a) note that gamification has become a contested term, with many opting for their own definitions due to differences of interpretation, oversimplifications, or discontent with current implementations. Seaborn and Fels (2015) also state that there is no agreed upon standard definition and that many alternative terms and similar but distinct concepts exist.

Huotari and Hamari (2012) define gamification as "*a process of enhancing a service with affordances for gameful experiences in order to support user's overall value creation*." This definition can be seen to find support from Deterding et al. (2011b), as they recommend against limiting gamification to specific usage contexts, purposes, or scenarios. Deterding et al. (2011b) use the term gamification to refer to game design elements, which they showcase five distinct levels of. From more concrete to abstract, the levels Deterding et al. (2011b) introduce are 1) Interface design patterns (such as badges, levels, leaderboards); 2) Game design patterns or mechanics; 3) Design principles or heuristics; 4) Conceptual models of game design units; and 5) Game design methods, like playtesting and certain design processes. All the suggested definitions so far share similarities (Seaborn & Fels, 2015; Deterding et al., 2011a; Deterding et al., 2011b; Huotari & Hamari, 2012; Hassan, et al., 2018; Huotari & Hamari, 2017; Kapp, 2012).

Seaborn and Fels (2015) point out that gamification has also been used to describe the creation or use of games for any non-entertainment context, and the transforming of an existing system into a game. In both cases gamified elements are inserted into existing systems. Gamification in education has referred to digital game-based learning and serious games, posing yet another interpretation (Seaborn & Fels, 2015). Seaborn and Fels cite several papers on this. For the purposes of this thesis the following definitions are introduced but not delved into deeper: other related concepts include alternate reality games (ARG) (McGonigal, 2011), taskification (Prestopnik, 2013), the gamenics and servicenics theory (Yamakami, 2012), emergent gaming (Benson, 2012), and games with a purpose (Von Ahn, 2006). Gamification can also be considered gameful design in practice (Deterding et al., 2011a). Seaborn and Fels (2015) cite several sources in explaining "*pointsification*", a criticism and related concept of gamification. Pointsification refers to the overreliance on points, badges, and leaderboards as methods of implementing gamification (Seaborn & Fels, 2015).

2.2 History and future of Gamification

Gamification is not an entirely new phenomenon, there is history in the notion that UI design could be informed by other design practices. During the first computer game boom of the early 80s research was done into deriving heuristics for designing enjoyable UI from video games, as well as analysing early text adventures, which led to suggestions that could make routine work more interesting. With the rise of UX as a profession, more research was done into "*hedonic attributes*", and "*motivational affordances*" of "*pleasurable products*". The field became known as "funology" and had game design as an important source of inspiration. (Deterding et al., 2011a). Nelson (2012) points out that gamification also has roots in marketing, educational structures, and attempts to increase workplace productivity through features like reward memberships, grades, and degrees.

The popularity of gamification has grown sharply in the previous decade (Hamari et al., 2014a; Koivisto & Hamari, 2019; Deterding et al. 2011a; Seaborn & Fels, 2015). Hamari and Koivisto (2013) cite a prediction by Gartner (2011), that 50% of organizations would have gamified their processes by 2015. Deterding et al. (2011a) also note that gamification is increasingly catching the attention of researchers, the idea of using game design elements in non-game contexts as a way of motivating, increasing retention, and increasing user activity has also gained traction.

Video games have become an increasingly popular and mainstream form of entertainment and people from all demographic groups enjoy them (Koivisto & Hamari, 2019). Media scholars argue that video games have become on par with literature, movies, or television in earlier generations (Deterding et al., 2011a). The use of gamification has been studied in education (Kosmides et al., 2018). Deterding et al. (2011a) note that gamification has spawned public debate and applications across various fields, ranging across productivity, finance, health, education, sustainability, news, and entertainment media. The interest in gamification is understandable as Kosmides et al. (2018) point out that games offer a more interactive and participatory way for people of all ages to better understand almost anything.

2.3 Gamification and persuasion

In a review of research around persuasive technologies Hamari, Koivisto, and Pakkanen (2014a) identified two dominant approaches to persuasion: persuasive technology and gamification. Both approaches aim to affect the user's psychological attributes, like

attitudes or motivations, and through this affect also affect their behaviour. The main difference between the approaches is that gamification aims to a larger extent to invoke the users' intrinsic motivation, while persuasive technology generally relies more on social and communicative persuasion. Persuasive technologies are often used in contexts where people would be willing to perform the targeted activities but have difficulties starting or continuing. (Hamari et al., 2014a.) Gamification can affect users through several ways, one of which is emotional reinforcement, as showcased by Macdonald and Brewster (2019).

Hamari et al. (2014a) note that all information systems can be considered to influence their users in some way, but persuasive technology has to be intentional. Persuasive technology has an intention to influence its users toward certain attitude or behavioural changes. In addition to intentionality, the event of persuasion and the strategy must be considered, with the event defining the usage and the user of the technology, and the strategy defining how the behaviour change message is delivered. This sort of technology implicitly assumes that human behaviour and attitudes can be influenced through technology. (Hamari et al., 2014a)

The majority of studies reviewed in Hamari et al. (2014a) reported positive results. Hamari et al. (2014a) reviewed empirical research into persuasive technologies and found that in 92.6% of the studies reviewed provided either positive or partially positive results. The papers reviewed had included an empirical study into persuasive technology (Hamari et al., 2014a). In another review (Hamari, Koivisto, & Sarsa, 2014b) gamification was also found to yield positive results, albeit with some caveats. These caveats included matters such as the results of gamification potentially not lasting long-term, and the engagement of gamification depending on several factors related to the users and the system itself. (Hamari et al., 2014b.) Blohm & Leimeister (2013) showcase four major elements that increase acceptance of gamification, these elements are (1) increase of user satisfaction, (2) conveyance of optimism, (3) facilitation of social interaction, and (4) provision of meaning.

2.4 Gamification, Games, and Play

In contrast to play and toys, gaming and games are defined by explicit rule systems and competition or strife. The design focus of gamification often focuses on rule-bound, goal-oriented play. (Deterding et al., 2011a.) Deterding et al. (2011a) argue that gamification should be differentiated from playfulness and gamefulness, with playfulness denoting qualities of playing and gamefulness denoting qualities of gaming. The qualities of play are more open, exploratory, and free-form, compared to the rule-bound, goal-oriented qualities of gaming. Gamification generally coincides with gameful design. Deterding et al. (2011a) suggest restricting gamification to the description of elements that are found in most games, already associated with games, and that are found to have a significant role in gameplay. (Deterding et al., 2011a.) The idea of gamefulness is also discussed in Hassan et al. (2020) and they list seven dimensions of gamefulness, which are accomplishment, challenge, competition, guided, immersion, playfulness, and social experience. Hassan et al. (2020) note that different gamification features influence these dimensions in different ways, with goal-setting and prompts facilitating most dimensions of gameful experiences that are thought to form the essence of gamified design.

Deterding et al. (2011a) introduce two current industry uses for the term 'gamification':

- The 1st is increasing adoption, institutionalization, and ubiquity of (video) games in everyday life.

- The 2nd is as video games can demonstrably motivate users and keep them engaged with them for long durations of time with high intensity, game elements should be capable of making other, non-game products and services more enjoyable and engaging too.

Gamified applications however in contrast to 'real' games may offer a more fragile, unstable flicker of experiences between playful, gameful, and other, more instrumental-functionalist modes (Deterding et al., 2011a). In other words, gamified applications do not as clearly focus on gamefulness when compared to 'real' games. This is to be expected as a major differentiator between gamification and games intended for entertainment or more serious use is that gamification aims to create a system with game elements, while not creating a full 'proper' game (Deterding et al., 2011a). Currently, gamification aims at increasing joy of use, user engagement, and improving the user experience. Gamification should however not be limited to any specific use contexts, keeping in mind that it can also be used in areas like training or health. (Deterding et al., 2011a). Additional areas are introduced by Aparicio, Vela, Sánchez, and Montes (2012), citing studies listing education, the development of respectful behaviour towards the natural environment, and improving the well-being of the elderly.

2.5 Serious games

Games offer a more interactive and participatory way of learning, that allows people of all ages to better learn nearly anything (Kosmides et al., 2018). Serious games started focused on education through experiments and investigation, while having entertainment as a secondary purpose (Kosmides et al., 2018). The link to gamification is clear, as serious games involve utilizing game-like features in non-leisure contexts. Kapp (2012) considers serious games as a subset of gamification. Definition by Marsh (2011): *"Serious games are digital games, simulations, virtual environments and mixed reality/media that provide opportunities to engage in activities through responsive narrative/story, gameplay or encounters to inform, influence, for well-being, and/or experience to convey meaning."* Pohjolainen, Mattila, Tuovinen, Rajanen, Arhippainen, and Alavesa (2021) also note that serious games can be defined in many ways but are essentially games developed to be more than just entertainment.

The idea of "serious games" dates back several millennia, having its roots in military uses but expanding into education and business in the second half of the 20th century (Deterding et al., 2011a). Digital games turned serious games into a more substantial industry and research field (Deterding et al., 2011a). These serious digital games can be defined as "*any form of interactive computer-based game software for one or multiple players to be used on any platform that has been developed with the intention to be more than entertainment*" (Deterding et al., 2011a). It is important to note that serious games are not limited to only electronic games, with board and card games having been around far longer (Kosmides et al., 2018). Serious games have proven effective in changing user behaviour models in real life (Enciso, 2001, as cited in Kosmides et al., 2018).

New game genres have also stretched the limits of games, in the form of so-called pervasive games. Examples of these games include games that take gameplay into public spaces, augmented reality (AR) games, persistent games that continually run, or alternate reality games (Deterding et al., 2011a). The currently available game development tools do not properly support the development of serious games (Kosmides et al., 2018). In addition to this issue, non-leisure game development involves serious pedagogical and practical challenges (Kosmides et al., 2018).

Serious games describe the design of full-fledged games for non-entertainment purposes, while gamified applications incorporate elements of games in non-game contexts (Deterding et al., 2011a; Hassan et al., 2018; Huotari & Hamari, 2017). Serious games can be seen as 'proper' games, while gamified applications are generally not viewed as 'proper' games. The boundary between what is a "*game*" and what is "*gamified*" is certainly not clear, and as an additional complication this boundary is at the same time empirical, subjective, and social (Deterding et al., 2011a). Adding an informal rule or shared goal by a group of users has the power to turn a gamified application into a 'full' game (Deterding et al., 2011a). The definition of "*games*" must take situated, socially constructed meanings into account (Consalvo (2009) and Taylor (2009) as cited by Deterding et al., 2011a).

Serious games offered a motivational boost to students and excited them about the topic as they were able to relate to video games (Petkov & Rogers, 2011). Prior research indicated that using video games in the classroom yielded a 40% increase in student learning over traditional teaching (Petkov & Rogers, 2011). Serious games created with a focus on educational content while sacrificing gameplay and engagement fail to appeal to students (Petkov & Rogers, 2011). The level of success serious games deliver in education is dependent on the game being well-structured and highly motivational, the game having well-defined rules that are accepted by the players, and having gameplay that keeps the players interested in the game (Kosmides et al., 2018). Usability issues have been noticed to greatly impact the desired outcomes of serious games (Pohjolainen et al., 2021b).

For a serious game to be appealing, the fun and engagement needs to be in the forefront with the education aspect well integrated with the gameplay and narrative (McMahon & Ojeda, 2008 as cited by Petkov & Rogers, 2011). This balance between efficacy and pleasure is also one of the greatest challenges in the creation of serious games: the games should provide enough but not excessive rewards, while being effective at building the users skills, competence, and knowledge (Kosmides et al., 2018) Pohjolainen et al. (2021b) found balancing entertainment and serious aspects a difficult task. Another meaningful issue found by Pohjolainen et al. (2021b) was implementing a behaviour change message on a deeper level into the game, rather than just seeming like "a coat of paint". An additional issue with existing serious games is that they do not allow adaptation to the educator's needs (Kosmides et al., 2018). Kosmides et al. (2018) argue that serious games should adapt to the interests of the player and the time they spend playing, providing necessary rewards like traditional games in this timeframe. In other words, these serious games should adapt in such a way that players get the necessary rewards, regardless of how long they spent playing and the game should appeal to the players interests.

2.6 Motivation and Self-tracking

Zichermann and Linder (2010) break motivation down into intrinsic and extrinsic motivation. Intrinsic motivation leads people to behave or act in certain ways as it aligns with their inner values. Extrinsic motivation to behave a certain way or partake in activities on the other hand comes from external rewards, such as money or status. (Zichermann & Linder, 2010) Gamification attempts should prioritize evoking intrinsic motivation as extrinsic motivation has been shown to produce negative effects, such as decreased intrinsic motivation (Deci, Koestner, & Ryan, 2001). Nicholson (2012) outlines theories that could help develop a more intrinsic strategy to gamifying.

Extrinsic motivation stems from external factors, such as money or social acceptance (Zichermann & Linder, 2010 as cited by Seaborn & Fels, 2015). Zichermann (2011) however argues that money can decrease motivation, while improving performance. Under intrinsic motivation behaviours are enacted and activities undertaken because they align with one's inner values (Zichermann & Linder, 2010 as cited by Seaborn & Fels, 2015). Intrinsic motivation is directly rooted in a given task, while extrinsic motivation aims at external goals, like financial compensation (Blohm & Leimeister, 2013). Gamified services are however capable of arousing intrinsic motivation (McGonigal, 2011). Gamification allows for the design of persuasive incentive mechanisms that go beyond financial incentives. This can be seen in badges; they comply with the intrinsic motivation of collecting but also have an extrinsic motive through gaining social recognition. (Blohm & Leimeister, 2013) Badges can help motivate users, acting similarly to challenges (Paajala et al., 2022).

The perception of something being extrinsically or intrinsically motivating depends upon individual and contextual factors (Deci, Koestner, & Ryan, 1999). The primary theoretical constructs for gamification are intrinsic and extrinsic motivation, grounded in self-determination theory (SDT) (Seaborn & Fels, 2015). SDT investigates people's inherent growth tendencies and innate psychological needs that are the basis for their self-motivation and personality integration, as well as which conditions foster these positive processes (Ryan & Deci, 2000). Ryan and Deci (2000) cite several studies in showcasing three needs essential for facilitating the natural propensities for growth and integration, and for constructive social development and personal well-being: the needs for competence, relatedness, and autonomy.

2.7 Self-Tracking and the Quantified Self

Choe et al. (2014) dive into Quantified-Selfers, or Q-Selfers, people who are a part of the Quantified Self movement. These Q-Selfers believe in "*self-knowledge through numbers*" and self-track numerous types of data about themselves. Choe et al. (2014) explain why Q-Selfers do self-tracking, what motivates these people, what kind of tools they use, what issues they encounter, and what benefits they receive.

In 2013 69% of US adults tracked at least one health indicator for themselves or a loved one (Fox & Duggan, 2013). In this group of trackers, 21% used technology of some kind, 49% kept track "in their head", and 34% did the tracking on paper (Fox & Duggan, 2013). It is notable that people with chronic conditions were significantly more likely to track health indicators other than weight, diet, or exercise or their symptoms than those with no chronic conditions (Fox & Duggan, 2013). Self-tracking was found to help cancer patients feel psychosocial comfort, be better prepared for the attending rounds, and overall improved symptom communication with clinicians (Patel, Klasnja, Hartzler, Unruh, & Pratt, 2012). Activity, food, weight, sleep, and mood were the items Q-Selfers most often tracked (Choe et al., 2014). Li, Dey, and Forlizzi (2010) however found that bank statements, email history, and credit card bills constituted the top three tracked items. Mobile phones have improved the field of self-tracking, due to their ability to support journaling, messaging, and automated sensing (Klasnja & Pratt, 2012).

Choe et al. (2014) found numbers similar to Fox and Duggan (2013), with 67% of Q-Selfers tracking at least one health-related item. 35% of Q-Selfers had health conditions, which also meant that improving health was a motivating factor with or without health conditions (Choe et al. 2014). When it came to data collection 21% of Q-Selfers had built themselves custom software, 56% used commercial hardware, and 40% used spreadsheets (Choe et al. 2014). Similarly for data exploration 44% of Q-Selfers used spreadsheets,

35% utilized custom software, and 27% relied on commercial websites (Choe et al. 2014). The high percentage of people using custom built software is explained by the fact that not many tools support the Q-Selfers whole self-tracking journey from data collection to analysis, therefore the ability to track, explore data, and to self-experiment using just a single tool incentivized Q-Selfers to create custom software (Choe et al. 2014). Another reason Q-Selfers built custom tools was to offer centralized tracking in one application rather than spread out across multiple ones (Choe et al. 2014). Many also built custom websites for data presentation (Choe et al. 2014).

Self-experimentation as a practice was important to the Q-Selfers. The Q-Selfers wanted to reach definitive conclusions from their tracking and analysis practices, such as correlations or causations. (Choe et al., 2014) As the name self-experimentation might suggest, the Q-Selfers sought to experiment on themselves. They generated hypotheses and then tested these on themselves by altering their behaviour and tracking the changes they experience. Q-Selfers got ideas for tests from carefully observing their own behavioural patterns, listening to other Q-Selfers talks, or individual needs (Choe et al., 2014).

Three main pitfalls were presented by Choe et al. (2014), these were 1) The practice of tracking too many things at once, 2) Not tracking triggers and context, and 3) Lack of scientific rigour in data collection, interpretation, and self-experimentation. Choe et al. (2014) also mentioned that many Q-Selfers had trouble properly interpreting their data. People wanted to draw conclusions from the data they had collected, identify correlations or even causations from it (Choe et al., 2014). The lack of scientific rigour in this aspect did not slow down or bother most Q-Selfers, as long as they were happy with the outcomes gained by tracking (Choe et al., 2014).

Choe et al. (2014) also provide a few implications for the design of self-tracking tools. Based on their findings self-tracking tools should provide users with feedback early in order to help them identify what they should track. These tools should also support self-experimentation by design and aim to maximize the benefits of manual tracking. Self-reflection should also be promoted by these tools. (Choe et al., 2014)

3. Game company study I: Collaboration needs

This chapter describes the first game company study of this thesis. The chapter describes first the aim of the study, next the process of planning interviews for game development company representatives and the process of contacting these companies, next the process of conducting an interview is described, and finally the findings of this interview are discussed.

3.1 Aim of the study

The first qualitative part of this study encompasses a game company study, whereby game development companies were approached and interviewed from a student perspective. The main objective of this part of the study was to investigate what sort of skill expectations game development companies have for students and how they feel about collaboration with universities. This was done with two angles of view in mind: 1) the skills expected for collaboration during student projects or course works, focusing more on the university collaboration, and 2) the skills expected of students to be employed at the company. These are distinctly different, as students collaborating with a company through university-company collaboration in the form of various coursework or thesis work generally do not get paid, so any end results they can give to the company come distinctly at no salary expense to the company. It can be expected that higher levels of skills are to be expected from students that are to be hired by a company. The motivation to study this topic arose from a personal interest to discover these requirements, trying to discover not only the technologies or skills desired, but also the level of expertise in said skills. This study was done during the traineeship at INTERACT, so results were also used to give feedback to the faculty in order to improve the variety and focus of courses.

3.2 Planning interviews and contacting

This study began by planning a contacting process to reach out to companies in the video game development business. A contact letter was designed through a few drafts. The letter was first written in Finnish and translated into English after it was seen that there was a need for a version in English. The translation was close to verbatim with some differences in the structure of sentences for better grammar. Briefly, in less than one page, the letter explained the research internship at INTERACT and the process of looking to collaborate with companies and at the same time gather materials for a master's thesis. This letter can be found as an appendix at the end of the thesis (Appendix A).

A few different forms of collaboration were suggested in the letter, including a brief visit to the company itself, a quiz on collaboration possibilities between the company and the University of Oulu, or a brief study, such as a literature review, game testing, user polls, or some other form of research. The form of collaboration would naturally be discussed with the company and designed such that it suits their needs and interests. Next, the letter introduced the author, explaining their interest into the field of game design, and showcased that the research into the field of video games previously in the form of a bachelor's thesis. If the letter was sent in Finnish, the message also contained a copy of this thesis (Vuolukka, 2020), while the English version of the letter contained a brief explanation of had been studied in the thesis. This approach was chosen due to the bachelor's thesis being written in Finnish.

The letter also offered the possibility of tailoring a master's thesis topic around the desires of the company, with an interest in working for them as a thesis worker. The rest of the

letter explained Ph.D. Arhippainen was instructing the traineeship and master's thesis, that the traineeship would happen during June, July, and August of 2022, presented a brief timetable of objectives for these months, and finally ended with personal details, contact information, and a desire to better discuss these topics in person or otherwise and wishing for a reply by a certain date. The date changed slightly depending on when the letter was sent. Contacted companies were given roughly a week and a half to respond from the day they were approached.

The contact process itself began with the collection of potential companies. Weight in collecting these companies was given to their physical location, favouring more locally operating companies first. The weighing for location favoured companies closer to Oulu the most due to a physical visit being much easier. This weighing however did not exclude companies outside of Oulu or even Finland, the list of potential companies including one based in Sweden, and another in Germany. Another important factor for considering a business was the level of familiarity with the company and its products. The companies from Sweden and Germany were included mostly due to prior experience with their games, so this sort of aspect played a role in the contacting process as well.

Initially a total of 14 businesses were collected and considered for contacting. A table was created containing the name of the business, their location of operation, the status of contacting, channels the company could be reached through, and other miscellaneous notes. Of these 14 companies, seven were contacted, beginning the contacting process with the businesses that operated in Oulu. The first round of contacting began on the 27th of May 2022, asking the companies to reply at latest by the 6th of June 2022. One business was contacted through an online contact form, one through this thesis' supervisor thanks to a personal connection, and the rest through email. Out of these seven contacting attempts, one led to a response.

This first study focused on conducting an interview with the respondent game development company. First the interview covered some basic demographics. The primary focus of the interview was on finding out what kind of prior experience the company had regarding collaboration with universities, what kind of collaboration would be or is useful to them, what kind of skills and knowledge they would expect from students regarding collaboration for example through coursework, and what kind of experience, skills, and knowledge they would expect, or advice students interested in working in the field of game development to have.

3.3 Conducting the interview

The study was conducted following a semi-structured interview. Key questions and topics had been planned but the interview itself included some more open-ended discussion. The decision to have the interview be semi-structured was made to keep the possibility of further exploring topics of interest that may arise during the interview (Adeoye-Olatunde & Olenik, 2021; Fossey et al., 2002). An interview guide was designed as described by Fossey et al. (2002). Also, due to the isolated nature of the interview it was not deemed important to strictly focus the interview on the pre-planned questions.

The interview took place in person at the University of Oulu on the 21st of June 2022. The interview took place in a meeting room with the interviewer and the interviewee present. The complete duration of the interview was approximately 40 minutes, and the audio of the interview was recorded. A complete literation was not created as it was deemed unnecessary in order to properly find answers to the questions posed in the interview. Answers to interview questions were collated based on the audio recording and notes

written by the interviewer during the interview. Permission to record the interview audio and to use the interview materials in this thesis were obtained from the interviewee. The beginning of the interview also included general information about the interview, an informed consent explaining to the interviewee what the aim of the interview is, what the results will be used for, and who will have access to the answers and data collected through this interview.

3.4 Findings of the interview

This chapter will go into detail on the findings of the interview, describing and analysing the answers to the interview questions in more depth. The findings of this interview can be split into two viewpoints, one focusing on the view of what companies expect from students and their skills, the other focusing on the process of finding a collaboration possibility. Skills students should have a grip on were an important part of the interview, both in the view of collaborating with companies during studies through coursework or thesis, and skills relevant for seeking employment in the game development industry.

3.4.1 Interviewee's background

Demographically, the interviewee was a male between the ages of 25 and 34, living in Oulu at the time of the interview. The interviewee has completed a master's degree in the field of Information Processing Science. The interviewee largely focuses on UI and UX design and development and game design in his company. The interviewee also possesses an understanding of several programming languages, game development and design, and game-related research. For the sake of the interviewee's anonymity, no further details about him are shared.

The interviewee had prior experience with university collaboration. Collaboration between the interviewee's company and universities has been both local in Finland, and international. Nationally collaboration has focused on providing topics for course work. International collaboration has been born largely through international projects.

3.4.2 Wishes and needs for future collaboration

The next set of questions covered wishes and needs for future collaboration with the University of Oulu. Collaboration was deliberately not limited to the study program of information processing science but was rather allowed to encompass the whole university. The interviewer and interviewee share experience with the information processing science program and had a solid understanding of the type of collaboration that could best happen.

The interviewee was very open to adding more collaboration between their company and the university. Due to the research focus and background of the company collaboration with universities and other research entities comes very naturally. Funding issues played a part in the ending of one collaboration project, despite this some actors from the university of Oulu remained as assisting consultants.

As the most probable forms of collaboration the interviewee mentioned continuing providing project course topics. In these courses students simulate industry standard project work, often working on project topics provided by companies. The interviewee had found these to be a useful form of collaboration and saw it as very likely that this form of collaboration would also continue in the future. Providing topics for thesis work

is another activity the company has been involved in. Visiting lectures were seen as another potential form of collaboration the interviewee could be interested in.

On average the interviewee has found collaboration with the University of Oulu to have worked effectively. He stated that capable individuals had been working on and managing to deliver well when it came to collaboration through the project courses. The interviewee also stated that during these projects there is quite little collaboration with the people responsible for the courses, and that the work focuses on the student group. The interviewee has written research papers with some of the university staff he has become familiar with through collaboration. He had found communication and collaboration to generally work well. During the student projects he had found communication to be important and they had generally communicated regularly with the student group.

Project course collaboration had been considered especially useful due to its highly practical nature for the company involved in it. The interviewee stated that they like that they can do initial probing development with the help of student resources, as they often are busy with more important work and cannot devote resources to developing multiple ideas. Another positive aspect was getting to see the level of practical knowledge students have. This way the company could also find talented students and network with more students. He stated that in these project courses the quality of the student work is not always so great and that the vision of their project can change during the project. Despite these factors he found it helpful to have students work on developing the company's initial ideas and this way getting to see more ideas developed in order to get a better understanding of how they would work. This project work also served as a way of talent scouting, with the interviewee stating that talented students could be invited to work for their company or to join them in additional projects. Providing topics for the project course also served as a way of better getting into the university networks, research projects, and often led to discovering useful contacts. The interviewee stated that their company looks for students with Unity development talent, and that during the project courses lots of time had been spent on learning basic skills, such as development languages. They also look for students with game development and design skills, with an interest also into students with graphical skills. Essentially the interviewee promoted students to view programming as a hobby.

The interviewee's company had collaboration with several other partners as well. These partners included several colleges and universities in Finland and internationally. Various persons had also worked in collaboration with their company, with wide varieties of expertise. They had also had collaboration with a local business support organization, with them helping with the founding of their business, funding ideas, and providing general consultation.

3.4.3 University students' skills

This chapter covers questions related to interview questions that aimed to find out what sort of skills this company would expect from university students. Namely the questions asked were "What sort of skills do you expect from students studying information processing science relevant to collaboration?" and "Several of the students in my field are interested in finding employment in the game development industry. What sort of skills should students have a grip on to achieve this goal? Could collaboration between your company and the university help in this regard?"

To the first question the interviewee stated that skills related to Unity development are useful. Quite often in collaboration with universities a large part of project work courses

is spent on learning the basics, rather than managing a deeper dive into development work. In general skills related to game development and design are welcomed and wished for. The interviewee also stated that it may be easier to find students with graphical and game design skill through Oulu Game Lab (OGL).

For the second question the interviewee also mentioned OGL as a good way to get in touch with the game development industry, learn relevant skills, and potentially find employment. In addition to OGL he mentioned the importance of a student having their own relevant projects, such as some simple games they have made. He mentioned that by following tutorials online, one could easily learn to create games and learn a lot of the relevant skills. Essentially, he recommended students to create a simple portfolio showcasing their talents and skills through their own projects. Adding to this, he noted that the games do not need to be mechanically impressive or overly complex, the focus should be on showcasing one's talents through their portfolio.

4. Game company study II: Concept Design

This second game company study was conducted during a research visit to Ikune Ltd during the traineeship at INTERACT. This chapter describes the research visit, the concept design work done during it and presents results from a small user study. Various features and UI design prototypes created with Ikune during the visit are also introduced. These were created to be presented to the customer company. Experiences of the research visit are also presented.

4.1 Ikune Ltd background

During the traineeship at INTERACT a research visit was conducted to Ikune Ltd. This company was chosen as the target of this visit due to the company having earlier collaboration experience with some courses and teachers of the information processing science degree program. This visit fit the schedule of the traineeship wonderfully, as Ikune had several concept level ideas, which could be worked on during the visit. Ikune was also in the process of potentially beginning a new project with an international client. The beginning of this project was not certain at the beginning of the visit, but the possibility was discussed. It was agreed efforts would focus on helping Ikune with said project if it were to begin. In early July this new project began, which played a massive role in the structure and tasks of the research visit.

Ikune Ltd is a small company consisting mainly of its co-founders and people they occasionally employ during their various projects. They also have a fair amount of collaboration with the University of Oulu, Politecnico Milano, EIT Digital, and other companies. The project mentioned earlier was arranged through EIT Digital. Ikune as a company focuses on the development of serious games and gamified mobile applications, with a bit of web development in the mix. The company has a major research focus, aiming to publish papers related to their various projects. The company website describes that the company "*…aims to make the world a better place with engaging data-driven gamified experiences*", and that they "*…aim to create new ways for humans to experience the world around them using the latest technologies*". The core skills of the company are game and web development, game design focused specifically on gamification and serious games, and rapid prototyping with a focus on the user. (Ikune Labs, n.d.) These core skills and values of the company also fed interest in the possibility of collaboration.

Ikune as a company has its roots in a university course. During a project course the co-founders had been tasked to develop a serious game aiming to help the unemployed at risk of alienation to better find employment and hone their job seeking skills. The project team had developed an interview simulator which would later become called HireMe, a gamified solution to improving an applicant's ability to find employment by helping them in their job-seeking activities (Mattila, Leinonen, Hietaniemi, Firouzian, & Pulli, 2018). The founders of Ikune discovered they had an interest in serious games through this project. One of the founders continued his career as a research assistant at the company that had given this project task. Eventually this led to the creation of their own company.

Projects Ikune has released papers on include at least Unus Terra, a serious game against COVID-19, and Ikune Racers, a project for testing blockchain based ownership and features in mobile games (Ikune Labs, n.d.; Paajala, Nyyssölä, Mattila, & Karppinen, 2022). IkuneRacers is also discussed and studied more by Nyyssölä in his master's thesis (Nyyssölä, 2020). The aim of Unus Terra was to foster social distancing among its players, aimed specifically at younger people who generally have lower compliance to

such practices (Pohjolainen, Arhippainen, Alavesa, Mattila & Tuovinen, 2021). Social distancing behaviour was favoured by the game through gameplay elements that encouraged players to play the game in a safe location, this was accomplished through GPS data (Pohjolainen et al. 2021a). Other location-based features included shorter time limits to complete levels, and the contagion level of the area (Pohjolainen et al., 2021b). Pohjolainen et al. (2021b) provide a more in-depth explanation of Unus Terra and its development.

4.2 Identification of game design needs

A large part of the research visit to Ikune consisted of identifying various gamification needs and developing potential gamified solutions to answer these needs. Several gamified elements were brainstormed, discussed, and prototyped on the UI level. The brainstorming and prototyping mostly happened within Ikune, with the team working together sharing ideas, discussing, and developing them to see if there is potential in them. These prototypes were later presented to Ikune's customer and feedback was received on the designs. The features and concepts will be presented and discussed further in the following chapters.

The contemplation and design of the gamified features took up a significant part of the visit to Ikune. The aim was to design features that would improve user retention, and keep users interested in using the application long enough. Gamified features can help accomplish these goals, but they need to be well designed and thought out, ensuring they fit the target users. The target user group was virtually all women that were experiencing menstruation, so had reached puberty, and not reached menopause yet. Naturally some other factors may also cause the menstrual cycle to stop but this sort of edge cases were not seen to affect the targeted user group significantly.

The size and variability in the target user group proved problematic during development. Designing features equally suitable for all age groups posed a serious design problem. Some features seemed very fitting for more limited parts of the user group, while being unfit for the whole group. A meaningful variable was the age of users, with older users more likely favouring a somewhat more serious approach in contrast to younger ones.

Several collaboration possibilities with Ikune were discussed, including documenting, and further developing existing ideas they had for various serious games. Participation into the afore-mentioned project focused on gamified features was not guaranteed at the time of initial collaboration discussion but was proposed as a possibility. Ikune had no certainty of their participation in the project at the time. Ikune had several ideas waiting development and better documentation, to name a few these ideas included a game related to recycling, an AR game based on the University of Oulu campus, and a game revolving around statistics of the user going to the sauna. This shows that Ikune certainly could find benefits from collaboration with the University of Oulu and students. While there was not necessarily a need for collaboration, Ikune did stand to benefit from it.

Ikune's serious game focused on recycling aimed to provide its users with statistics related to their recycling behaviour and this way help people recycle more and live in an eco-friendlier way. RFID or Bluetooth could be used to identify users or players, which would allow to connect their recycling to their application profile. This data would allow the game to display statistics to the player about resources they save through recycling, the impact on nature, on their finances, and a detailed look at what materials they recycle, how much, and so on. Ikune aimed to implement gamified features into this application and ideas included feeding a monster with the players recycling, and a map with different

graphics depending on the level of recycled materials. An idea for pilot testing the application was to try and find help from PSOAS, the student housing foundation of northern Finland. PSOAS could potentially provide Ikune with the possibility to pilot test their prototype. Ikune had created a functional prototype that would allow the user to identify themselves with an RFID tag. The other serious game ideas were not as detailed and will not be described here.

4.3 Designing gamified features

The features showcased here were all discussed with the team at Ikune, these ideas were also presented to the customer. Many of these ideas also reached the UI stage, where UI prototypes of them were created. The ideas included an avatar or pet, social networking possibilities, wiki-like information hubs, the level of anonymity, daily challenges, longer-scale challenges, and quizzes. More ideas, some on the more imaginative side were also discussed but mostly in passing and are not covered in this thesis.

4.3.1 Virtual pet

The idea of a virtual pet was worked on and discussed for a fairly long time, some parts of the idea even reaching the phase of UI design. Ultimately the idea of a virtual pet was not included but several matters about it were considered. The developments for the pet were not wasted though, as the idea was later redesigned into a more human-like companion. Essentially, the pet would act as a form of emotional connection to the application, similarly to Macdonald and Brewster (2019). Unlockable in-app accessories were also considered, where the user would be rewarded with in-app currency through using the app, playing minigames, or through unlocking badges at certain milestones. The accessories could for example be things like clothing, hats, jewellery, or glasses. The pet was ideated to be a simplistic vaguely drop shaped creature and will be showcased more later.

There is immense positive potential in the pet. It served as a potential way to solve one main issues, which was figuring out how to keep the users involved with the application while they are not suffering symptoms or undergoing their menstruation. Essentially the pet sought to solve the issue of why users would use a menstrual cycle tracking application even while they are in other phases of the cycle than menstruation. The pet would need periodic caretaking such as feeding, napping, and playing games with it. Such features and an emotional connection to the pet could entice users to come back to the app regularly to take care of their pet and simultaneously log some form of symptoms and keep the app in mind.

More potential could be found in the pet in using it for educational purposes. At different stages of the menstrual cycle the body needs different nutrients. For example, a diagnosis of iron deficiency was more likely during menses than the luteal phase (Helm, McGinnis, & Basu, 2021). The pet could crave for certain types of food that are high in said nutrient, and also tip the user to eat that food or something similar ensuring they get the correct nutrients. As an example, if during a certain stage of the cycle the body needs more iron the pet would tell this to the user and then showcase their hunger for foodstuffs high in iron.

It was also ideated how the recurring, cyclical nature of the menstrual cycle could be incorporated into gamified features. This attempt to create something recurring that utilizes the natural cycle of menstruation led to further ideation of the pet. With the topic being very intimately connected to fertility an idea was had that each month the user

actively used the application they could be rewarded with a new pet. It was considered that the pet could be hatched out of an egg the user needs to care for during the proliferative and luteal phases of their menstrual cycle. Then at the end of the user's cycle, at the end of menstruation, this egg would hatch had it been taken care of. Other ideas related to the cyclical nature were also discussed. The time between menstruation could have been used to prepare for some form of event during menstruation. Ideas included preparing the pet for a race or preparing for some kind of battle. These ideas however did not progress further in development.

An initial idea was to have these hatched pets be randomly generated, allowing for different sizes, shapes, and colours. This was further developed to potentially include variance created through the user's activity in the application. If during a cycle the user had logged a very painful menstruation with lots of pain symptoms, the pet could be red in colour, and have an angry or mean appearance. While if menstruation was less painful and the user logged fewer symptoms, the pet would be a calmer colour, and have a more positive expression. The application could include a "gallery", where users could see all their pets. Another approach was that rather than hatching an entirely new pet each month, the users could instead develop their pet further after each full menstrual cycle. The pet could for example grow in size, gain some form of visual improvements, or unlock the ability to wear hats or accessories. The opportunity to improve their pet could keep users engaged with the application.

It was however deemed that a potential issue lies in the idea of hatching pets. The topic is very closely related to fertility, and clearly builds connotations to having children and giving birth. Thus, it was important to consider that all users may not have a normal menstrual cycle or may be infertile or not capable of giving birth for a variety of reasons. Without a more thorough user study it is difficult to evaluate how users would react to such features. This and unenthusiastic feedback from Ikune's customer ultimately led to abandoning the idea of a pet.

4.3.2 Avatar, leaderboards, and minigames

An idea similar to the pet was the idea to allow users to create their own avatar that they could then modify and potentially use in minigames of some sort. This idea was largely inspired by Bitmoji (Bitmoji, n.d.) and would work similarly, except features of the avatar could be unlocked through payments with in-app currency. Adding an avatar runs into the issue that the user needs an incentive to modify it, so it essentially needs to be a reasonably central and visible part of the application. Therefore, this idea of an avatar led to the natural next step of use cases for it. Some ideas that came up for the avatar were some forms of social features where you could allow others to see your avatar, another idea was that the avatars could be used in leaderboards, some sort of map, or to play minigames with your friends.

4.3.3 Social aspects and competition

The potential of social networking features was also briefly investigated. Social networking could be implemented on a smaller scale by adding friends and acquaintances or on a larger scale, such as forums or something like social media. A location-based social system was also considered, where users would be capable of competing with other users globally or in a smaller local area. Competition could happen in things like small and simple daily goals, that are tasks related to using the app given to the user every day. Examples of such tasks included interacting with the pet, logging some symptoms, playing a minigame, or interacting with the social side of the application. Larger

challenges were also considered, where people would compete to contribute the most towards a large goal. This could be something like inputting a total of one million symptoms during a month. At the end of the month the users that contributed the most would get some form of in-app rewards. The implementation of a form of competition needs to be very carefully designed. If the user can gain in-app benefits from suffering from several or severe menstrual pain symptoms, they may be tempted to cause self-harm or self-neglect to better compete with other users. Any feature rewarding negative symptoms would have to be designed extremely carefully, and probably should be avoided all together.

4.3.4 Educational aspects and quizzes

An educational aspect to the application was also theorized, possibly including some form of information hub or forum. Information provided by this information hub, let's call it a wiki, could then be incorporated into other parts of the application as well. Suppose the user logs a certain symptom they could then have a message showing where to find additional information about this symptom and possible remedies to it. This message could have been delivered by the pet. The forums could be used to discuss symptoms, share remedies, and so on. Social interaction with other users would act as a way of peer support and discussion, so users would not feel they are alone with their issues or symptoms and could find help and relief in the fact that others also experience these. These ideas could also be combined by allowing discussion of topics in the wiki. Topics could have discussion areas where users can share thoughts and remedies.

Quizzes can be a useful combination to go hand in hand with the idea of educational content. Users could first be exposed to educational materials in the application and then they could do a small quiz on the topic. Completing this quiz adequately should reward the user with in-app rewards, such as currency or a badge of achievement.

4.3.5 Daily goals and challenges

Goals and challenges were already mentioned earlier but they should be discussed in more detail. Daily goals should ideally take the form of simple, quick-to-complete tasks that the user receives daily. These goals should provide the user with a small in-app reward to entice their completion. Ideally these goals would have enough variability that users are not exposed to the same goal too often to avoid them feeling repetitive. In this case users could be asked to log different things, such as their mood for the day, how they slept in terms of quality and duration, menstrual symptoms, or to interact with certain parts of the application. It was also seen as potential to have these tasks be a sort of to-do list for each day. Users were to receive notifications reminding them to complete these tasks. Integration with software such as Apple HealthKit was considered a possibility for tracking sleep and many other health related variables. Integrating HealthKit data would make usage of the app more convenient for the user as it would do much of the tracking for them. The way users would input their mood was also considered, ranging from smileys to a round dial UI. Utilizing the avatar or pet of a user was also considered as a way of input, with the avatar or pet asking the user questions related to these tasks to make logging them feel more natural.

Challenges were envisioned to function as larger, more long-term tasks for the users. These could be something along the lines of logging 3 months of consecutive menstrual cycle tracking, using the app for a certain number of consecutive days, or collecting a certain number of pets in the application. Challenges could also serve as a form of competition if they were issued to a friend group, to people located in the same city, or

even globally. Once the challenge is finished the users at the top of a leaderboard would be rewarded with in-app rewards. Challenges would aim to be a more social activity, while users could individualistically collect achievement badges. A challenge would motivate users through competition, while badges would serve as a form of completionism and extrinsic motivation. Challenges could help users feel a sense of competence, leading to increased motivation (Paajala et al. 2022).

4.3.6 Rewards and badges

Rewards are a key part of gamification, and this project was no different. Thought was put into the potential rewards of using the application and what users could do with said rewards. As noted earlier an in-app currency was considered for the purchase of cosmetic upgrades to the user's avatar or pet. This currency was to be gained through active use of the app. Additional potential uses for this in-app currency were to unlock some non-key features of the app. This would give the users a sense of progress and accomplishment as they unlock new parts of the application. Only features of secondary importance would be locked to the user, such as the forums. Essentially features that are not necessary for the usage of the application but are a nice bonus, additional minigames could serve as another option. Another consideration was collecting in-app currency to pay for real-world services or products. This poses the risk of users potentially creating fake entries in order to accumulate more currency for real-world benefits.

Rewards can also take the form of collectables, such as badges of achievement. Badges were also considered during this project and were recommended to the customer. These badges should be rewards of accomplishment, when the user reaches certain milestones, they would be met with a bit of fanfare and given a badge. Like challenges, badges can help motivate and provide game enjoyment to the user by offering goals (Paajala et al. 2022). Later, the user can look over all the badges they have collected. Badges can help the application provide positive emotional reinforcement and motivation to work on unlocking the next badge (Werbach & Hunter, 2015). In this application badges were rewarded for social activities such as inviting friends to use the application, logging symptoms, taking part in remedies, and many others to name a few. Badges also have a "level" system, where badges can be improved upon reaching more difficult milestones. The first level of a badge may be rewarded for performing a certain action once, then the next level requires more repetitions of this same activity such as 10. This allows for easier design of more numerous badges and can entice users to seek to level up their badges in addition to unlocking new ones.

4.3.7 Comparison and anonymity in social interaction

Some features that were not directly linked to gamification that were considered included matters such as comparison to other users and the level of anonymity in social interactions. Comparison to other users could either happen on a large scale or could be limited to the friends of the user, or possibly by age group if age were something users would need to provide the app with. It was thought that competition in this way could serve as a decent feature, but the design team had trouble making decisions on what should be measured in said competition. As noted earlier, competition involving negative symptoms could lead to issues. A reasonable area of competition could have been the users' pets or avatar, as these would not directly involve things like logging negative symptoms.

The matter of levels of anonymity in the application was also considered. The topic touches on something very intimate and sensitive, so anonymity may be preferred if users

were to interact in public forums or compete with each other across leaderboards. This matter, however, seems very user-dependent and would have to be studied deeper in order to develop a good consensus. Privacy options could allow users to tune their privacy to a level they are comfortable with. Users could sign up with their full name but choose to alternatively display a nickname to other users or users who are not their friends. Nicknames seemed to be the best solution, allowing users to have a certain identity, while remaining anonymous to strangers. This way users would also be recognizable on potential leaderboards or in games they might play.

4.3.8 Sharing symptom remedies

An additional idea for the application was a user-contribution section. The aim of this feature, called remedies, was to allow users to share practices that had helped them with their menstrual or endometriosis symptoms, such as pains. Examples included instructions for stretches or yoga or enjoying certain types of drinks like tea. This feature aimed to increase collaboration between users, creating a sense of community, while also providing the users with valuable information. Social or online interactions help provide the user with a sense of relatedness, important again for motivation and game enjoyment (Paajala et al. 2022).

4.4 Early design phases

This chapter showcases the UI design prototypes created during the visit to Ikune. The purpose of these prototypes was to help evaluate and showcase design visions of the application to Ikune and their customer. Most designs were created in collaboration with Ikune. Created designs will be showcased and discussed in this chapter. Several of the following figures were created by people working for Ikune Ltd. Illustrations created by the employees of Ikune are used in this thesis with their permission.

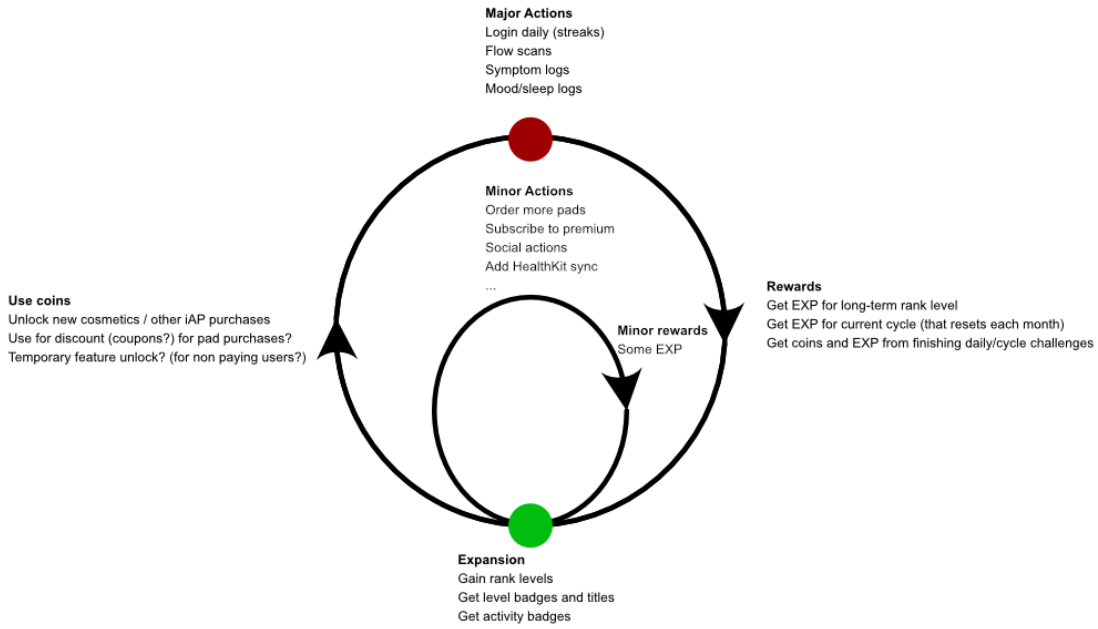


Figure 1. Initial core loop design of the application (created by Ikune and used with permission).

Figure 1 illustrates the initial core loops of the application. This illustration was created by employees of Ikune. Using the application was envisioned to rely on two main loops of usage. Both of these loops featured expansion as a key part of the loop. Expansion

meant a few different things in this context: gaining levels on the users' application profile, and gaining new badges for levels or activities, and unlocking new titles. Many of these features, such as user profile levels, were later redesigned or excluded from the final application, as can be seen in Figure 2. Providing the user with rewards motivates them to keep using the application and can help them set goals for themselves, for example through aiming to unlock a certain badge. The smaller of the core loops was envisioned to provide the user with minor rewards for minor actions. Minor actions could be actions such as subscribing to a premium version of the application, performing certain social actions in the application, or synchronizing the application with Apples HealthKit.

The more major core loop included using an in-application currency, simply referred to as coins, to perform purchases within the application. Purchases could be things like new cosmetics for an avatar or pet, temporarily unlocking purchasable features for non-paying users, or unlocking real-world discounts for relevant products. Major actions in this large loop would provide the user with larger rewards. Major actions focused on using the main features of the application regularly and involved things like logging in daily, logging new scans, logging symptoms, and logging the users' mood, sleep, and other tracked features. The application developing customer sought a feature where users would scan special menstrual pads, which would allow the application to better diagnose their situation regarding endometriosis. Rewards for completing these actions would be experience points (EXP) for both the users' rank level, the current monthly challenge cycle, and gaining coins and more EXP for finishing daily and cycle challenges.

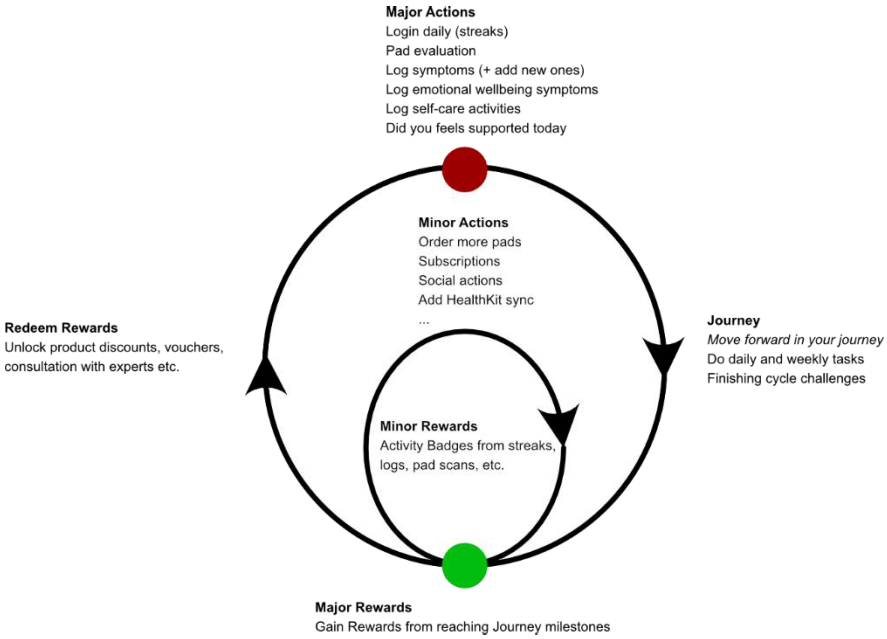


Figure 2. Finalized core loop design of the application (created by Ikune and used with permission).

Figure 2 displays the finalized core loop design of the application. The similarities with Figure 1 are clear, and the main loop of the application has remained the same. While Figure 1 was created to serve as guidance for the design and development of the application, Figure 2 was created after most of the features of the application had been designed and planned in more detail. This way, Figure 2 represents the internal working of the designed application. As noted, the core loop remained the same, but more finish has been put into rewards and actions, along with the introduction of the *Journey* reward system. Rewards are more clearly divided into two distinct reward types: minor and major rewards. Major rewards are awarded for reaching milestones on the users Journey. Rewards gained through the Journey include things like discounts, new colour themes,

new companions, loyalty points, free products, expert consultations, or pieces of advice. The Journey will be explained and illustrated in more detail later. Minor rewards are condensed into activity badges. While Figure 1 had a step for spending coins, in Figure 2 this is replaced with redeeming rewards. The major actions remained largely the same, with the additions of logging self-care activities, and asking if the user felt supported. The major actions have also been rewritten to be a bit clearer. As noted earlier, rewards were exchanged into the Journey, where the user would move forward completing daily and weekly tasks, and finish cycle challenges. Effectively the Journey is the way the user works on unlocking rewards.

4.4.1 Initial design solutions

This chapter displays the earliest UI designs the team created. These designs were presented to Ikune's customer as concepts for the application. The designs presented here have been censored in order to not give away the identity of the customer.

Designs in Figure 3 were created by employees of Ikune Ltd. and are used with their permission. Figure 3A displays one of the earliest designs for the main screen of the application. Early design ideas attempted to incorporate lots of cyclical design features, as the application was focused on the menstrual cycle. Figure 3A has a central 'clockface' or 'compass', which tracks and displays the status of the user's menstrual cycle. Underneath this central feature the application also offered a prediction of the remaining days of the current cycle period. The front page also included a section for daily flow scans, reminding the user to do their scans of the day. The water droplets showcased the strength of the previous flow, ranging from one to five droplets. These signified the amount of fluid lost during the previous scan. The plus icon allowed for quick access to the scanning interface to allow the user to easily do their scan. On the very bottom of the screen a different colour profile tab was included that could be dragged up in order to open it. The opened profile tab is visible in Figure 3B. Users could quickly see their current level from the unopened tab.

The profile tab in the early design phase was still quite primitive and did not include many features. It was unclear whether this sort of feature would be developed further so it was kept plain to begin with and used more as proof of concept. The profile tab would display the current day of the cycle at the top of the screen, similarly to Figure 3A. The profile tab in Figure 3B would display the current level of the user, along with their progress to the next level. This progress is displayed by the background of the text displaying the level filling in with blue as the user progresses closer to the next level. Estimated remaining days of the user's current menstrual cycle phase were also displayed. The number of total flow scans the user had made so far was displayed at the bottom of the screen. The profile tab also included the user's pet, displayed centrally in Figure 3B. In these early stages of development, the pet did not really have features yet.

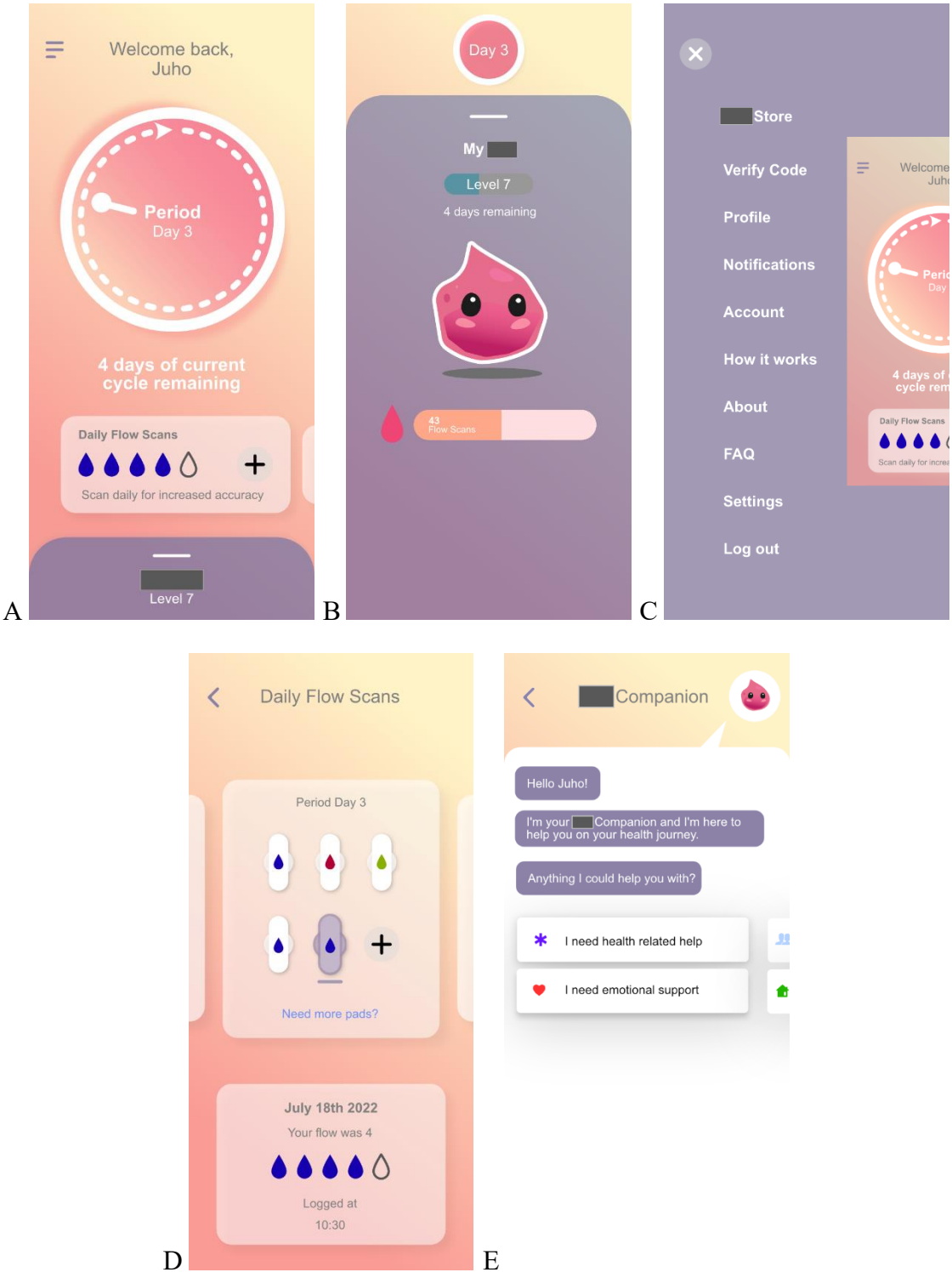


Figure 3. Early UI design views: A) An initial main screen of the application, B) early design profile tab open, C) hamburger menu opened, D) Flow Scan menu, and E) Initial companion design. (Created by Ikune and used with permission).

Figure 3C displays the hamburger menu visible in the top-left of the screen on Figure 3A opened. This menu simply served as a way for the user to access different parts of the application. It included several ideas for implementable screens and features that were not yet designed into the application. Many of these followed typically available mobile application features, such as customizing the notifications the application can send, typical settings, and an FAQ section about the application.

Figure 3D displays the daily flow scan menu, accessed through the 'Daily Flow Scans' feature seen in Figure 3A. This screen also displayed the day of period the user was on, along with the scans made during that day. The different colours on the scanned pads indicated the level of flow the user had been estimated to experience. The plus icon allowed the user to add another flow scan. The window with the scans could be swiped left and right to visit past days and to return to the current day. On the bottom of the screen the current date could be seen, along with details of the user's previous flow scan. The details included the level of flow, and when the scan was performed.

The concept of a discussion bot or helper was concepted and incorporated into the design process quite early. An early version of this companion feature is on display in Figure 3E. Initially, the design team hoped to incorporate the virtual pet into this companion feature, having the pet serve as a customizable companion to the user. Later, this would however undergo redesign after feedback from the customer and Endo Warriors, an endometriosis support group. The UI design of the companion was quite straightforward, with the discussion area taking up most of the screen. At the top-left the user was offered a way back out of this view. The companion was imagined offering the user several forms of support and guidance, ranging from practical health-related matters to emotional support, and possibly tips on how to manage menstrual or endometriosis symptoms. Users would choose from predefined options and their companion would provide them with answers.

4.4.2 Alternative design solutions

Designs in Figure 4 are designed by the author. These designs were created to display design ideas to both the customer and to designers at Ikune to potentially spur new ideas and design combinations. Figure 4A displays an alternative design of the main screen. The central 'clockface' or 'compass' is replaced with a simpler circle, displaying whether the user is undergoing their menstruation currently, and which day of it they currently are on. The central circle could also be tapped to open additional features visible in Figure 4B.

Similarly to Figure 3A, this design includes the scan menu, which was simplified with the intention that the one in Figure 3A would be used. The hamburger menu in the top-left has also been retained. In Figure 4A the central circle is part of a larger timeline, represented by the smaller overlapping circles to the left of it. This timeline could be dragged to revisit past days in case the user had missed logging something or simply wanted to see what had happened in the past few days. This timeline could also have been expanded to offer predictions to the user, allowing it to be dragged into the future. This would for example allow the user to see when the application expected their menstruation to end. The bottom tab familiar from Figure 3A has been replaced with the tasks and challenges feature in Figure 4, still accessible through the same tab.

Figure 4B represents the view the user is taken to by tapping on the central circle visible in Figure 4A. This view served a menu, allowing the user to access more parts of the application. The black outlines around the circles signify a UI design idea; the circles could have been made uneven and somewhat 'slimy' in appearance. During design the smaller circles seen in Figure 4B were imagined allowing the user to access other parts of the application, such as the in-app store, some social features, the user's goals, statistics related to the user, and possibly scanning or a menu for the pet, which could for example allow it to be customized.

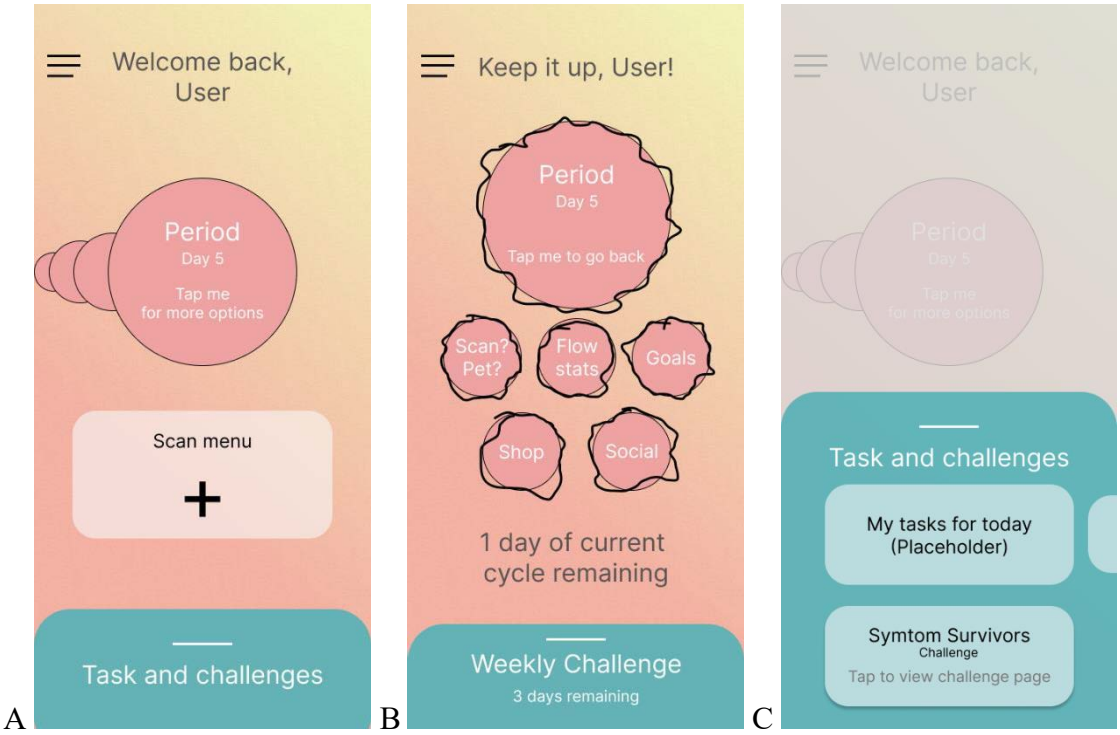
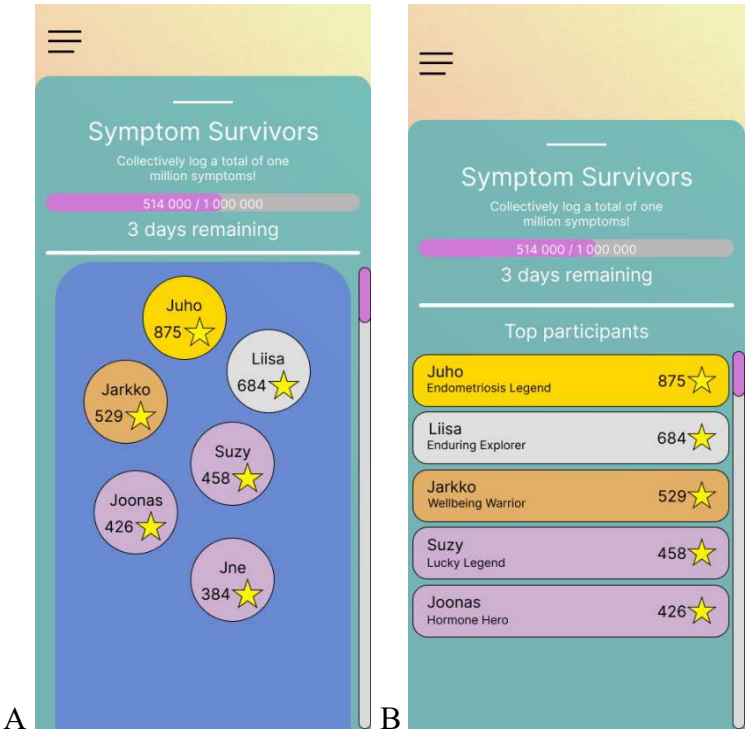


Figure 4. Alternative design: A) Alternative main menu design, B) Day details menu open, and C) Bottom tab swiped up to display tasks and challenges menu. (Created by the author).

The transition between the screens in Figures 4A and 4B could also have been done by having the smaller circles seen in Figure 4B separate from the large central one in Figure 4A. This idea of 'slimy' or 'goopy' UI items was not seen as a great idea and did not see further developments. Some form of more animated and livelier UI and menu functionalities could still have served as interesting additions to the application.

The blue bottom tab seen in Figure 4A has been further developed to display days remaining in the current challenge. A renaming of the tab was also considered. The tab can be seen open in Figure 4C.

The tasks and challenges tab was envisioned to serve two purposes. Firstly, it was intended to allow users to easily view their daily tasks, represented by 'My tasks for today' in the design prototype. Each task item (light blue background) would display what the user needed to do that day. In further developments these task items would've also displayed the user's progress towards completing that task, similarly to the solution in Figure 5A. Secondly, this tab served as a way for the user to access the challenge page dedicated for a longer-term challenge. This was done through the button below the user's daily tasks. These challenges could be either weekly, as suggested in Figure 4B, or longer. The length of these challenges was undecided at the time. Two design ideas for this challenge page were created and are introduced in Figure 5.



A B

Figure 5. A) Leaderboard for a large month-long challenge and B) alternative challenge leaderboard design. (Created by the author).

Figure 5A depicts a more unique leaderboard idea, when compared to that of Figure 5B, which presents a simple, straight-forward list-like leaderboard. The leaderboard in both figures displays the collective challenge at the top, providing a suitable challenge name, a description of what needs to be done to partake in this challenge. A bar displaying progress towards completion of this task was also displayed, along with an indication of how long the challenge would still be ongoing. Beneath this information was the main leaderboard itself.

The design idea of the leaderboard is that each user is represented by their username and a score, displaying how much they've contributed towards the completion of the challenge. The user with the most points, in this case Juho with 875 points, would be displayed at the very top. In places two and three respectively are Liisa and Jarkko. An idea better suited towards Figure 5B was to have the name and score of the top 3 displayed with the typical competition medal colours behind them: gold, silver, and bronze. The rest of the competitors would be represented by a more generic colour. At the end of one of these longer challenges the users at the top of the leaderboard would receive the greatest rewards. All participants could be rewarded to promote participation, while the greater rewards still give incentive to compete.

A key motivator in the design of both of these prototypes was to allow the user to show off what they had collected or achieved while being displayed on the leaderboard. Figure 5A provides a very abstract demonstration of the author's vision. The final vision for the leaderboard in Figure 5A was to have users potentially represented by their pets, which would allow them to showcase their pet and the customizations they had done to it. This would give users an incentive and motivation to unlock new customization options for their pet. The deeper blue background behind the users 'blobs' was envisioned to represent a river or liquid of sorts, in which the pets would sail or swim in competition with each other. This liquid theme could've been fitting with the design ideas discussed relating to Figure 4B. Had this idea been further developed, the username and score of each user could've been displayed underneath their pet.

Figure 5B had a simpler list view to the leaderboard. A key difference between designs in Figure 5A and 5B, was that the design in Figure 5B was better suited for the possible inclusion of user titles. Titles were envisioned to be another collectible customization item, unlocked through completing challenges, tasks, and generally progressing in using the application. The titles were displayed underneath username, such as 'Enduring Explorer' underneath Liisa. The titles presented in this design are for demonstration and had a little bit of humour sprinkled into them, as they were not intended to represent the final implementation of the feature. Ultimately, Ikune Ltd suggested their customers include titles tied to the level of the user's companion.

4.4.3 UI design developments

The designs presented in the previous chapter were later further developed based on additional background research and feedback obtained from Ikune's customer. The customer showcased some of the earlier designs and visions to Endo Warriors, receiving useful feedback from the group. This feedback was delivered to Ikune and similarly had an impact on the future designs. The further developments are discussed in this chapter, presenting relevant design screenshots as figures, in a similar manner as the previous chapter.

4.4.4 Main screen and timeline

Figure 6 presents a new design of the application's main screen. 6A was designed by employees of Ikune. This screen was developed from the designs of Figure 3A and Figure 4A. Remarkable differences to the previous design in Figure 3A are the inclusion of the pet in the top-right of the screen along with its welcome message, the reworking of the central element to a timeline similar to that of Figure 4A along with the addition of the estimated blood loss, the addition of the bottom tab navigation, and the clear overhaul of the colour choices. The overhaul of the colour scheme was largely based on background research, which indicated that more neutral, clinical colour tones would generally be preferred by users due to not being as attention grabbing (Epstein, Lee, Kang, Agapie, Schroeder, Pina, Fogarty, Kientz, & Munson, 2017).

Figure 6B was designed by the author with the main goal of redesigning the central timeline presented in Figure 6A. Essentially Figure 6B is a combination of the design ideas of Figure 6A and the old design in Figures 4A and 4B. The additions to the timeline presented in Figure 6A are incorporated to the old design solutions in Figures 4A and 4B. The timeline is slightly reworked, adding additional information inside the central bubble, along with a red glow. This glow served as an indicator of the current day, allowing the user to see the predictions of the applications by visiting the circles to the right, or to see information from past days by visiting circles to the left. The pet from Figure 6A is added, along with placeholders for the other features, such as the scan menu, and the bottom navigation menu.

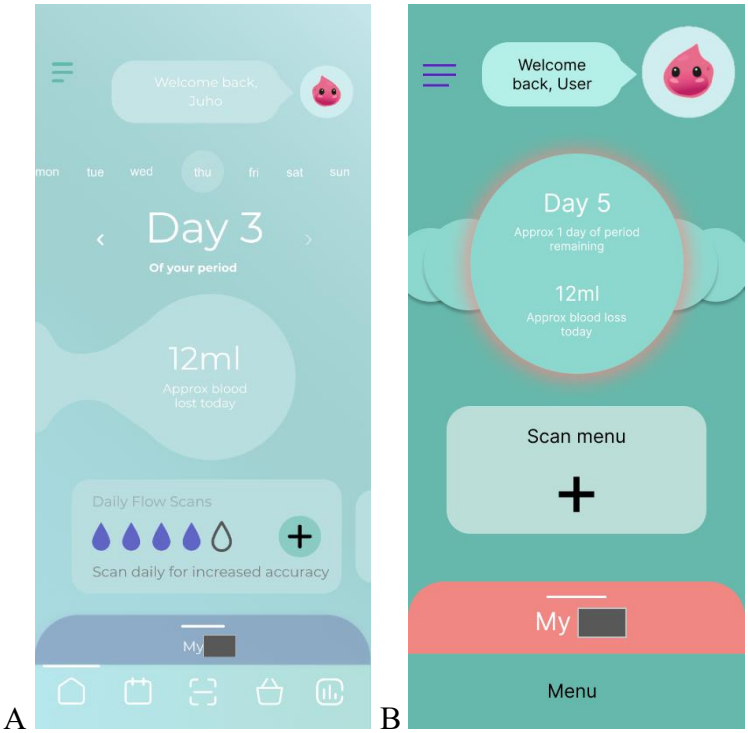
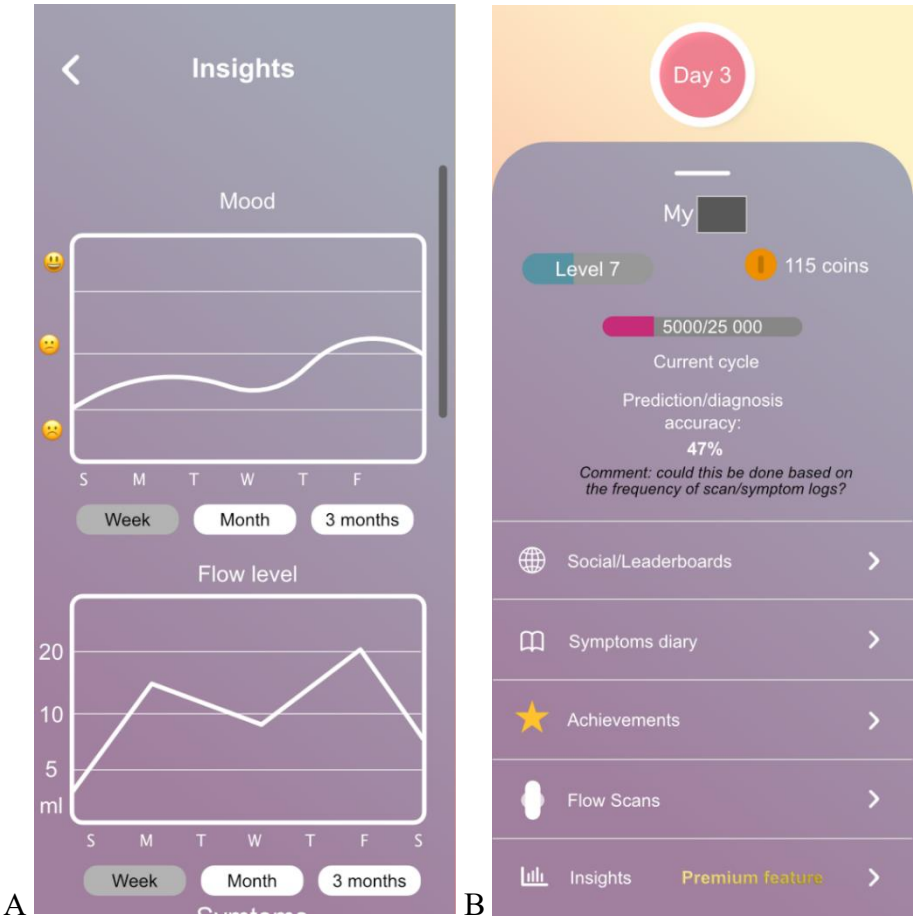


Figure 6. A) New design of the main screen by Ikune (used with permission) and B) Alternative timeline design by author.

4.4.5 Insights statistics screen, profile tab, and symptoms diary

Figures 7A and 7B were designed by employees of Ikune. Figure 7A depicts an initial design for an 'Insights' screen. This was envisioned to offer the user graphs and statistics created from the data they enter while using the application. The design team considered statistics and especially visual graphs something most people are fond of. The design in Figure 7A included a few placeholder graphs to showcase how they could be implemented. The graphs showcase data on the user's mood and flow level during the last week of entries. Provided are also buttons that allow the user to see a graph from the last week, month, or three months.



A B

Figure 7. A) Initial design of the Insights statistics screen and B) Profile tab developed further. (Designed by Ikune and used with permission).

Figure 7B depicts the profile tab first seen in Figure 3B. The contents of the tab have been effectively completely redesigned, along with a clearly more fleshed out design. Some things have remained as they were in Figure 3B: the level indicator along with its progress display, the day indicator at the top of the screen. New additions are the coin count display, current cycle display and its progress bar, the level of prediction or diagnosis accuracy in a percentage, and the list of accessible pages. Access to pages includes the pages of Social/Leaderboards, Symptoms Diary, Achievements, Flow Scans, and Insights. These pages were grouped together in this tab, as they are all connected to the user quite personally. The symptoms diary can be seen opened in Figure 8. During this stage of design, the inclusion of premium features was discussed and prototyped, as can be seen by the Premium feature tag next to Insights. Premium features would require the user to be a paid subscriber to the application to access them.

The percentage display for prediction or diagnosis accuracy was added as it could help the user with transparency. This percentage was envisioned to change according to the frequency of scans and symptom logs the user does. The level of accuracy in predictions is very important (Epstein et al., 2017).

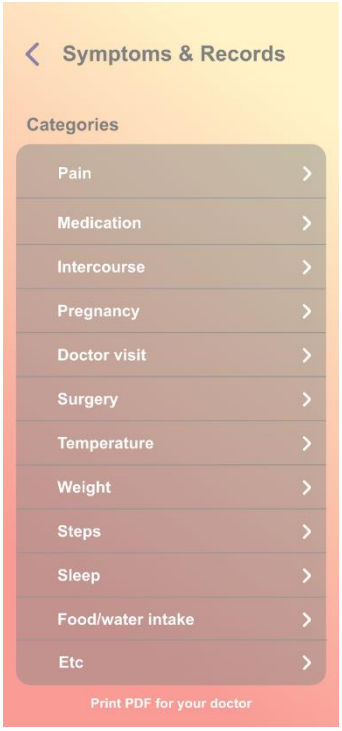


Figure 8. Symptoms diary open. (Created by Ikune and used with permission).

Figure 8 depicts the design of the symptoms diary screen, accessed through the screen showcased in Figure 7B. The different categories presented in Figure 8 could be visited by the user to learn more about the chosen topic. This screen provided users with the ability to print a PDF of their tracked data. This could be useful for example for a visit to the doctor, where the tracked data could be discussed in more detail. The ability to easily export and summarize data was deemed important by Epstein et al. (2017).

4.5 Involving users in the design process

This chapter will focus on describing how users were involved in the design and prototyping process of the application. Feedback was received mainly in three ways:

1. from Ikune's customer company,
2. focus groups conducted by the customer company,
3. and a user study conducted by collaboration with Ikune during the research visit.

The user study conducted in collaboration with Ikune took place in Finland, while the customer company arranged their research abroad. The user study conducted by the customer will not be covered in this thesis, as understanding of the study is limited to simple written notes and permission for using these notes has not been received.

Endo Warriors, a support group for women with endometriosis was involved in the development process through the customer (Endo Warriors, n.d.). The customer presented prototypes and design ideas that had been created with Ikune. These prototypes included the idea of a virtual pet, which was met with resistance and did not receive support from Endo Warriors. They also felt critical of the topic of gamification, feeling that such a serious topic might not be well suited for a game. It is possible that a part of this critique stemmed from not having a complete understanding of gamification, and they may have been more receptive had they been presented with a more thorough explanation.

Another important source of feedback was of course the customer. While they may not necessarily have been end users of the application, they still provided valuable insight into what their final vision of the application should look like. Prototypes and designs were showcased to the customer in multiple online meetings. Designs were then altered based on the feedback received. The customer employed experts on endometriosis, whose feedback was very valuable.

Finally, the user study arranged with Ikune offered another important source of feedback and information. During the project research had been done into which features were important, and what sort of design decisions were often found poor. The arranged user study allowed the gathering of feedback on presented designs and to test whether the prior research findings were accurate in this case. Information was also gained on the perceptions regarding menstrual cycle tracking applications and gamification.

4.6 The user study

The user study for collecting feedback, ideas and needs relating to concepts was arranged in Finland with Ikune. In the study, the concept idea and a set of UI views were shown to the participants while asking for opinions and comments on the presented ideas. In total two participants were recruited for the study. In both study sessions the author was responsible for interviewing, while an employee from Ikune Ltd. was responsible for observing and taking notes. Both sessions were arranged partially remotely: in the first interview the author was physically present with the participant, while the notetaker participated remotely. In the second interview the notetaker was present with the participant physically, while the author participated in the interview remotely. This approach was chosen due to convenience and schedule constraints.

Questions were designed in preparation for the study sessions, these can be found in Appendix B. The questions ranged across the participants menstrual cycle tracking habits, perceptions on gamification, and questions connected to designs presented in the interview. The study sessions were arranged in a semi-structured manner, so the prepared questions served as a basic script for the sessions. Many additional and explorative questions were asked to gain a better understanding of the participants answers.

At the beginning of the session the participants were asked to sign an informed consent form, informing them of the practicalities and their voluntary participation to the study and participation in this research. The consent form can be found at the end of this thesis as Appendix C. They were also asked to sign a non-disclosure agreement (NDA) on behalf of the customer. The study participants were female, between the ages of 21 and 40. The participants did not have pre-existing medical conditions they would have been aware of. One participant was Finnish, while the other originated abroad. Additional details regarding the participants are kept anonymous for their privacy, as the subject matter is very sensitive. The participants were convenience sampled due to time constraints put on by the customer company.

A set of slides were created in preparation for the user study sessions, consisting of nine distinct slides. Each slide presented the participants with questions, with four of these slides containing images of the UI design with questions related to the designs shown to the participants. In total the participants were presented with 8 different UI design views.

In the beginning of the user study participants were asked about their habits of menstrual cycle tracking, such as do they track their cycle, how they do it, why they do it that way, when do they do their tracking, and what kind of problems are associated with their

chosen way of tracking. Questions also explored whether the participants have experience using applications for tracking their menstrual cycle and what would make them use apps if they do not currently use one. The questions presented can be found in Appendix B.

After these initial background questions, the participants were showcased screenshots of the current application design and questions were asked that related to these designs. Three views of the Treatments screens were shown to the participants (Figure 9). Questions the participants were presented with were: "*Would you like to see suggested solutions to different period symptoms in the application?*" and "*If users could create and vote on these treatments would you feel comfortable trying them?*".

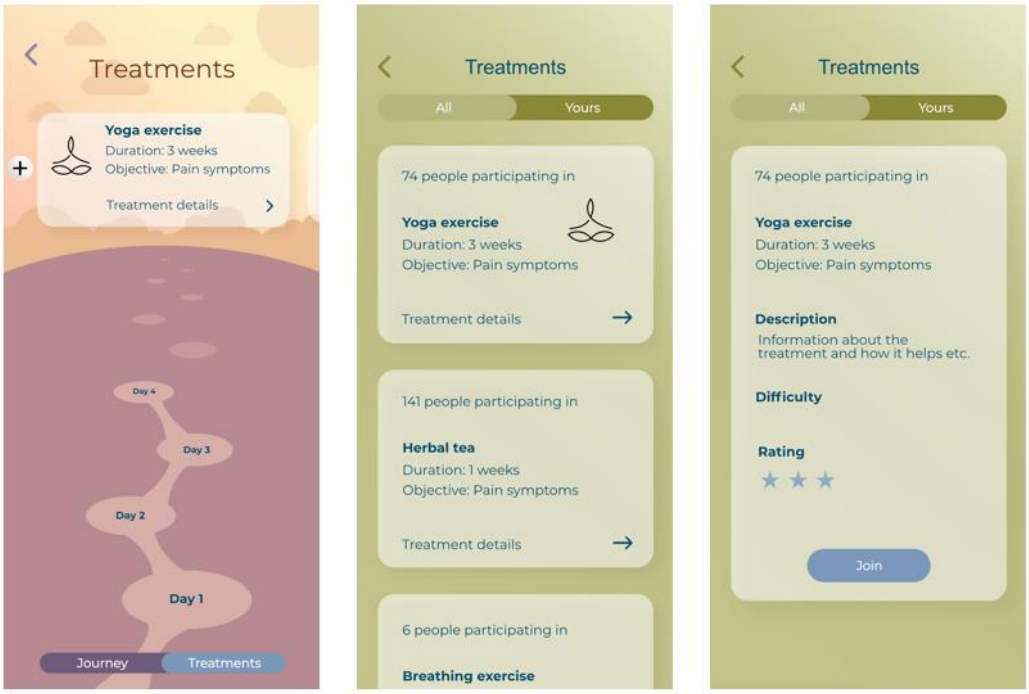


Figure 9. The Treatments UI views presented to the participants. (Created by Ikune and used with permission).

Next the participants were shown the UI designs presented in Figure 10. The participants were asked about their feelings towards these designs, and what they liked or disliked in these designs. Participants were also asked to provide their feedback on the colour scheme choices for these designs, and whether they liked the colour scheme or not.

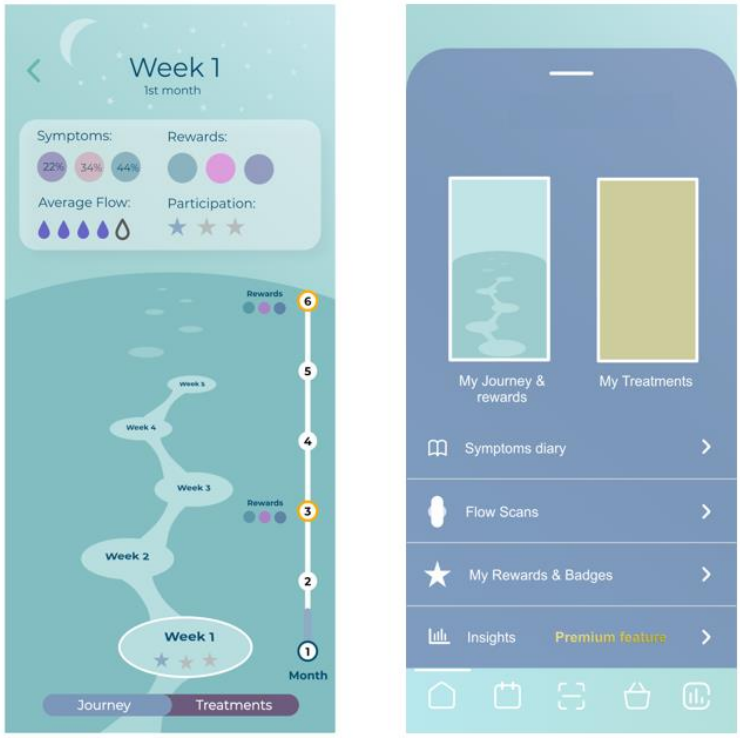


Figure 10. These UI views were presented to the participants (Application name anonymized). (Created by Ikune and used with permission).

After the previous Figures had been discussed, participants were asked questions related to gamification. Participants were provided with a brief explanation of gamification if they were unfamiliar with the topic, and subsequently asked the following questions: "*What do you think of including such features into menstrual cycle tracking applications?*" and "*Do you think an application like this can be fun or game-like?*". After this, users were again presented with UI designs, this time related to rewards and badges, shown in Figure 11.

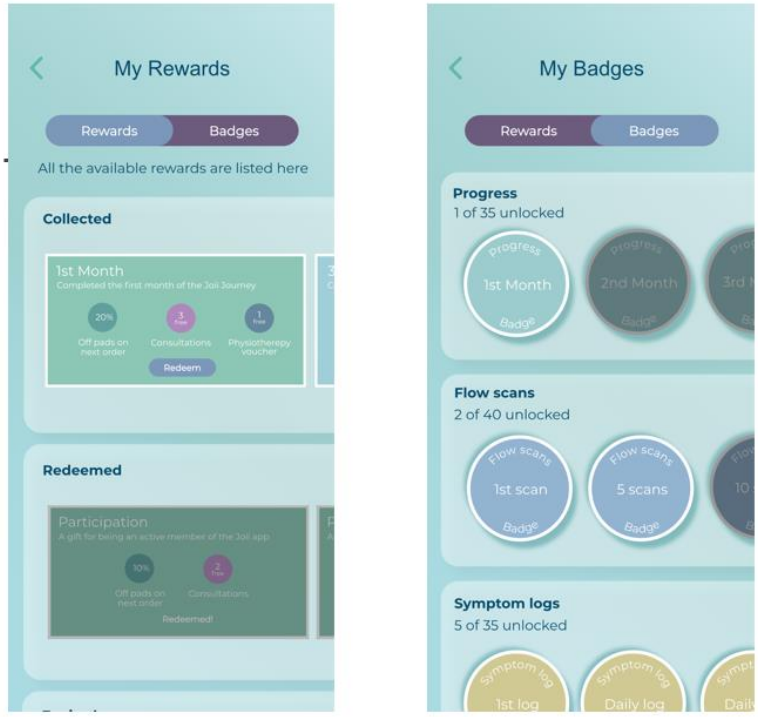


Figure 11. The UI designs of My Rewards and My Badges presented to the participants. (Created by Ikune and used with permission).

Questions asked regarding to the designs in Figure 11 included again a brief explanation of the purpose of these features, after which the questions investigated if users found such features helpful, if they are fitting for the application, if participants consider them motivating or engaging, finally participants were asked what kind of features would motivate or engage them, along with asking if they have earlier experiences with similar features or applications. Participants were also suggested a few different features that could be found motivating or engaging, such as various rewards, virtual goals, or a virtual pet or garden to name a few.

Finally, the participants were asked questions related to the companion. Along with the questions, they were presented with a design of the companion's chat screen (Figure 12). The participants were asked if they had earlier experience with similar features, whether or not they found them useful, and how they felt about similar chat bots or companions in general.

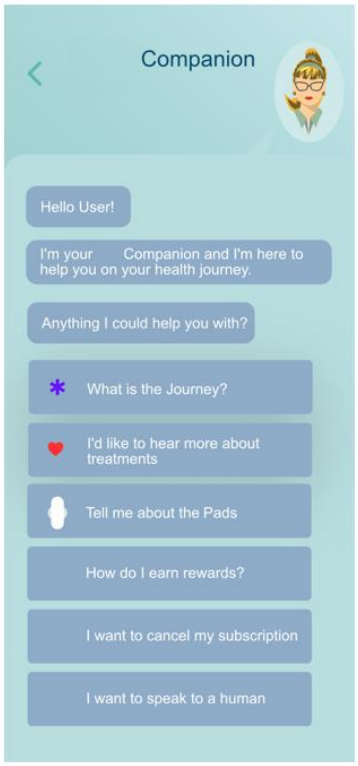


Figure 12. The UI view of the companion (Application name anonymized). (Created by Ikune and used with permission).

4.7 New ideas, similarities, and differences in user study findings

This section will describe the findings of the user study sessions. The observer and notetaker wrote notes on both interviews, which were then later analysed. The findings of the analysis were categorized into similarities and differences between the sessions, and noteworthy or otherwise interesting findings. The following chapters will go over the findings of these study sessions.

4.7.1 Prior use of similar applications

To begin with, both participants had previously used menstrual cycle tracking applications. Participant #1 had used Flo for a year or two. Participant #2 had used these applications for only a month or two but did not name which ones. The participants had both also quit using these applications. When asked why they had stopped, participant #1 had privacy concerns and had seen a lot of discussion around what kind of data the

application she used collects. Participant #2 felt that the application did not provide enough value for the effort put into using it. Both participants considered ease of use and usability as important factors in deciding which application they would use. A visually pleasing user interface was considered important by both participants.

4.7.2 User-created remedies and colours of the application

The participants felt positive towards the user-created remedies feature. Both participants were open to trying remedies shared by other users. They felt that the non-binding nature of the remedies was especially enticing, they saw that they could try out a remedy, and in case they did not enjoy it or did not find benefits they could easily stop partaking in the remedy. Both participants also had a positive reaction to the idea of displaying the number of other users participating in a certain remedy. In general, the reaction to remedies and the related features were positive. The participants were also asked about how they felt about the colour themes present in Figure 10. Both participants had a positive opinion of these colours.

4.7.3 Pad Scanning

The participants had a mixed reaction to the new pad scanning feature planned for the application. Participant #2 found the idea a little disgusting but still seemed accepting towards it, if it could help users reach a faster diagnosis. Participant #1 considered scanning very intimate, and raised concern regarding privacy, anonymity, and security.

Participant #1 was surprised by the feature but did not straight up consider it good or bad, and like participant #2, seemed open to the feature. Participant #1 worried if there would be a collection of their scans somewhere, and who would be capable of seeing them. Participant #1 also wanted the image of the scan to go away after it was taken, and to be replaced with a symbol indicating that the day's scan had been done. This was how the application was planned to function.

Reactions to the scanning feature were somewhat surprising, being neither overly in support of it, but also not strongly against it. It is possible the feature was seen as a form of medical intervention that could help reach a diagnosis, which led to higher acceptance despite concerns and initial emotions.

4.7.4 Journey, rewards, companion and badges

Participants were presented with an earlier design of the Journey, shown in Figure 10. In this version the rewards granted to the user became rarer as they progressed along the Journey. Rewards were condensed to months 1, 3, and 6. Leaving months 2, 4, and 5 without additional rewards to the user. The participants generally found this undesirable, with participant #1 stating that they might forget about the rewards and give up pursuing them if they were granted rewards too rarely. Participant #2 had similar ideas, stating that being granted rewards more often would keep their motivation up better. Participant #2 also considered monthly rewards a good feature, and in general wanted to see rewards being granted more frequently.

The interview touched on questions of gamification, providing the participants with a brief description, and asking questions such as do they feel like such features fit into a menstrual cycle tracking application, and do they feel like such applications can be fun or game-like. Generally, both participants reacted positively to the premise of gamification and saw it as an acceptable inclusion. Participant #1 promoted the ability to

customize the user experience again, suggesting that users should be able to opt out of gamified mechanics if they so desired. Participant #2 also noted that the menstrual cycle and related events are not a sickness or disease and saw no obstacle to making the application fun.

The participants also made comments about the personality and feel of the application. Both participants promoted the idea of positivity and support to the user. Participant #1 commented that notifications sent by the application should be ones that put the user in a good mood, characterized by fun, light-heartedness, and cheerfulness. The participant did not desire the notifications to be to the point and cold. Participant #2 also desired the application's personality to avoid feeling "cold", and desired motivational, positive notifications. Participant #2 stated that the application should almost feel like a supportive old friend and should have some personality to it.

Questions were included related to the companion, asking participants if they had earlier experience with such features, if they find them useful, and how they feel about them in general. These questions were accompanied by a design, show in Figure 12. Both participants had earlier experiences with chatbots. The participants perceived the Companion avatar presented in Figure 12 in a negative light. Participant #1 perceived the companion's avatar as judgemental and desired the avatar to look more sympathetic or neutral in expression. Participant #2 commented that the companion looks scary, with very typical human features but no eyes. From the final designs, for example Figure 15, we can see that the companion was changed based on this feedback. Both participants had found chatbot features useful in their earlier experiences, stating that they help the user find what they are looking for easier. Participant #1 had experienced annoyance with chatbots, stating that one had been interfering with using the app. The participant wanted to have full control over how long a discussion with the chatbot goes on for.

The feedback from participants on badges was somewhat mixed, but they were at least not seen as a negative feature. Participant #1 did not directly comment on badges, discussing more about rewards and streaks. Streaks refer to continuous, usually daily, visits to the application that may provide some reward to the user. The participant considers these as functional reward systems and uses Duolingo as an example, stating that people 'play' Duolingo even in bars. Participant #1 also states that these features might not be mandatory for adults but should serve as useful features for improving engagement with younger users. Participant #2 considered badges as useful rewards but felt the current badges were boring and meaningless. The participant considered more interesting, more unique, possibly 3D badges a better implementation. Participant #2 also commented that interesting and motivating rewards could include customization options, like colour themes, and options to customize the user interface.

4.7.5 Menstrual cycle tracking

Participant #1 tracked their menstrual cycle with the help of a calendar, along with calculating the length of their cycles, and drawing a graph of this. In contrast, participant #2 did not track their menstrual cycle in any way, stating that they have a very regular cycle, and that they do not see a need to track it. Participant #1 stated that the calendar has a problem of forgetting to track their cycle, but this issue also extends to applications. They also stated that the graph helps them detect anomalies and visualize the situation as a more visually oriented person. The participant logs their cycle into the calendar when they happen to remember it. Participant #2 felt that tracking their cycle is a waste of time and takes a lot of effort. If an easy to use, useful, and fast application were available the participant could consider using it.

Initially, participant #1 started using a cycle tracking application for practical reasons. They aimed to stay up to date about their health, and simultaneously learned to identify patterns, namely when their menstruation was coming up. Participant #2 started using an application years ago in an attempt to help organize their life better but eventually forgot about the use of the application and felt like it was a lot of work to keep using it. A cute UI helped them choose which application to ultimately use.

Neither of the participants currently used menstrual cycle tracking applications. They were however asked about what would make them start using one again. Participant #1 wished to see the possibility to view more graphs about their data, and a possibility to follow their trends on their own. They also wished that the application would notify them if something alarming happened, so the user would not have to think about such matters themselves as much. Participant #1 also stated that it is important that the application feels reliable, and helps the user save brain capacity and time. Participant #2 stated that the application should be cute, including animations, pictures, and the like. Importance was also placed upon being aesthetically pleasing. They also noted that all women have different expectations. Participant #2 also felt that ease of use was important. In the past they had felt that applications had not offered much new information based on the inputs they had made, so the participant wished the application would do more with their data than simply repeat it to them in the form of a graph.

4.7.6 Social aspects and quality of user-submitted content

Participant #1 commented that the remedies section should require some form of moderation to ensure reasonable quality of user-submitted content. This participant also desired a feature that would allow them to find their friends using the application. The participant noted that it would be an interesting addition to be capable of seeing which of their friends were partaking in certain remedies, along with the ability to invite friends to participate in remedies together. In general, participant #1 indicated interest into more social features. Participant #2 provided feedback on the term treatments, which was still used during the interviews, stating that this term made them question if they are sick. This participant suggested changing the term into suggestions or activities, noting that treatment may be too heavy as a word.

4.7.7 Continuity of use

Participants also provided their views on streaks and rewards within the application. Participant #1 liked the idea of streaks, and seemingly was familiar with the feature from other applications. This participant also desired the ability to log their entries in a reflective manner, for example once per week or once per month. The participant stated that this would help them build continuity and reduce the pressure they feel from using the application. Participant #2 did not directly comment on streaks but noted that they would like to see rewards granted to the user more frequently, in a way that the user would not have to go several months without clear rewards. This participant felt that this would best motivate them to keep using the application when it comes to rewards.

Despite the early idea of a virtual pet being considered it was not a part of this user study. Interestingly, participant #2 still brought up the idea of a virtual pet, describing how it would grow with the user, their path, and bring a more personal touch to the application. They felt that this would make them feel like the application really belonged to the user. The idea of a pet companion was also suggested to participant #1, they felt that the pet could be sympathetic but questioned the knowledge a pet would have for guiding and instructing them.

4.7.8 User goals and health situations

Participant #1 had found different 'modes' in applications a useful feature as these allowed the user's experience to be tailored to their goals. As examples they mentioned a pregnancy mode in Flo, stating they considered it a useful feature and considered returning to Flo if such a use case became relevant. The participant generally felt that in case of large changes, such as pregnancy, abrupt ending or beginning of menstruation, or diagnosis with a disease, the applications may offer more help. Participant #1 also brought up the difference between electronic and more traditional tracking on pen and paper. They noted that tracking on paper felt more organic, personal, private, and like they were doing it on a more delicate frequency.

4.7.9 Educational and knowledge sharing aspects

Participant #2 hoped to see educational content within the application. The participant spoke of how Finland has very high standards in education but in some countries topics like this are not discussed at all. This could lead to a lack of understanding of young people's own bodily functions. Participant #2 also considered that the chatbot or companion could help incorporate more educational content into the application. They noted that the companion could also be asked about topics, and it would provide explanations. This participant also commented that the companion should have a professional appearance, so that users can trust it more.

The study also explored the possibility of including an anonymous discussion forum. The participants generally had similar reactions, stating that it might be an interesting addition but would have its issues attached. Participant #1 considered the possibility of a *Jodel*-like chat feature unnecessary, while participant #2 thought it was a reasonable feature. Participant #1 raised concerns over mis- and disinformation being prevalent on such platforms and considered the ability to privately chat with friends enough, stating that other applications can serve as platforms for anonymous discussions. Jodel (Jodel, n.d.) is a hyperlocal discussion application, where people can make posts anonymously about any topic. User can also vote on content, and comment on other's posts. The application utilizes location data extensively, allowing users to only see and interact with posts that were made within a certain geographical distance of them. A similar idea was proposed during the user study sessions.

Participant #1 brought up the topic of synchronizing the user's menstrual cycle with relevant actions in the user's life. This referred to things like energy levels, what to eat, when to be most productive, when to exercise, and when to rest during the different stages of the menstrual cycle. The participant had discussed this topic with friends before, but they had not come across scientific research on the topic and would like to know more. The participant suggested that the application could incorporate some such feature, again providing more knowledge and practical suggestions to the users of the application.

4.8 Finalized UI design

After the completion of the previous phase, developments continued in collaboration with the customer. Due to time constraints with studies, the finalized UI designs were created by the employees at Ikune. The user study showcased in the previous chapter had an influence on the design decisions at this stage.

4.8.1 Onboarding and main menu

The design idea of an effective onboarding system had been discussed and considered during the earlier steps of the design process, but Figure 13 depicts the first developments towards an onboarding system. The onboarding was envisioned to include a progress bar at the top of the screen. The screen depicted in Figure 13 asks the user to select symptoms they are experiencing. The empty squares represent various pain types and locations, naturally the squares would contain illustrations in the final application. The selections made by the user during the onboarding process would then customize the application and its use. Documentation by Ikune Ltd explains, that the onboarding will explain the Journey system, Companion, daily tasks, and scanning functionalities and their usage to the user.

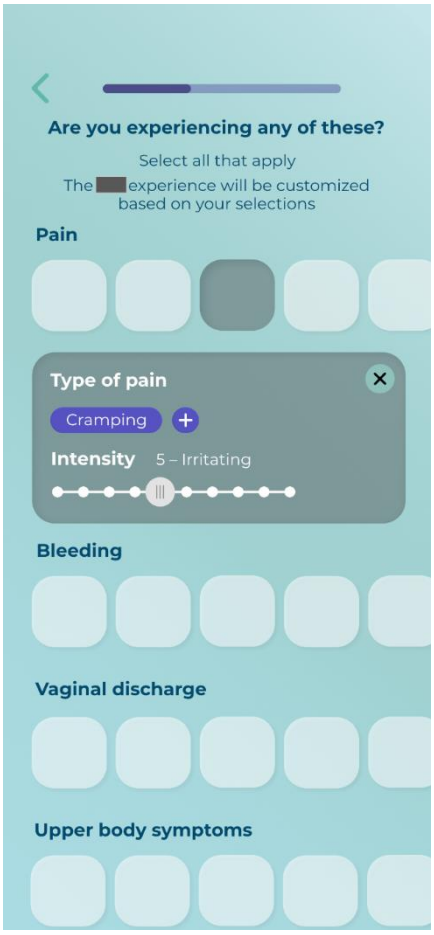


Figure 13. Onboarding system. (Created by Ikune and used with permission).

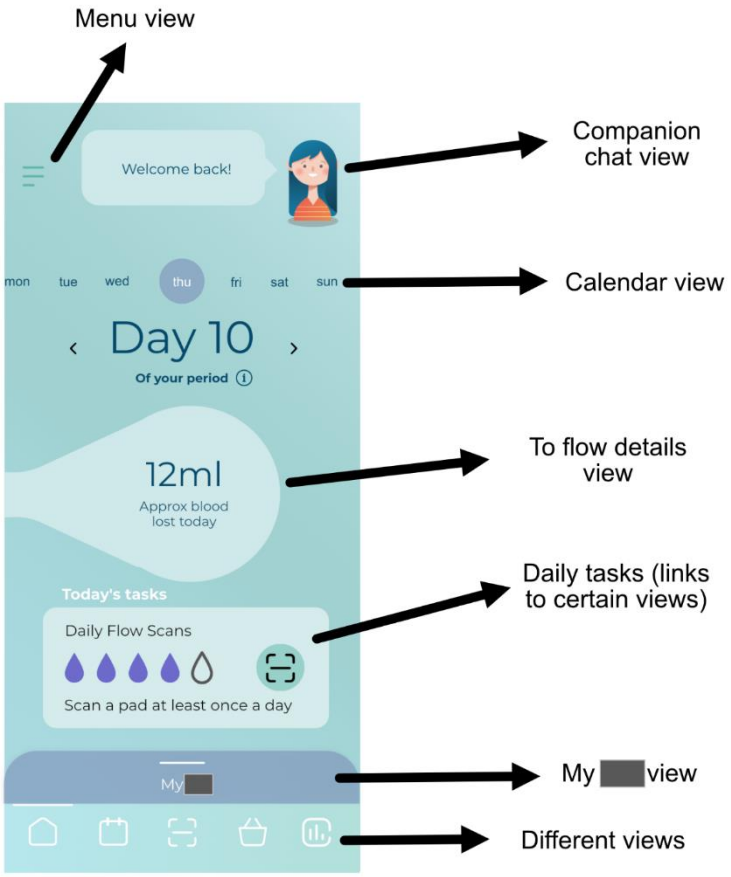


Figure 14. Main screen with feature explanations. (Created by Ikune and used with permission).

The main screen of the application, depicted in Figure 14, remained largely unchanged from the previous iteration, as seen in Figure 6. The clearest changes are the abandoning of the pet and changing it into a Companion, the font has also been changed into a darker colour to provide more contrast and make it easier to read. The figure also includes brief explanations of the various parts of the UI. The companion's avatar has been reworked based on the feedback received from the user study.

4.8.2 Daily tasks

Figure 15 depicts four possible states for the 'Today's tasks' feature seen in Figure 14. These states serve as examples of the daily tasks users could receive during use of the application. Figure 15A asks the user to log a symptom they are experiencing today. The user would need to be provided with a way to complete this task even in case they aren't experiencing any symptoms during the day. Figure 15B showcases a way the daily tasks could be used to remind or suggest to the user some helpful remedy they could partake in. Figure 15C asks the user to log their state of emotional wellbeing on a simple scale of one of to five. Data collected through these tasks would then be utilized in statistics the application showcases, as was prototyped in Figure 7A. Finally, Figure 15D depicts a situation where the user has successfully completed all their daily tasks. The application notifies the user of the situation but reminds them that they can still log additional flow scans or additional symptoms they may experience during the day.

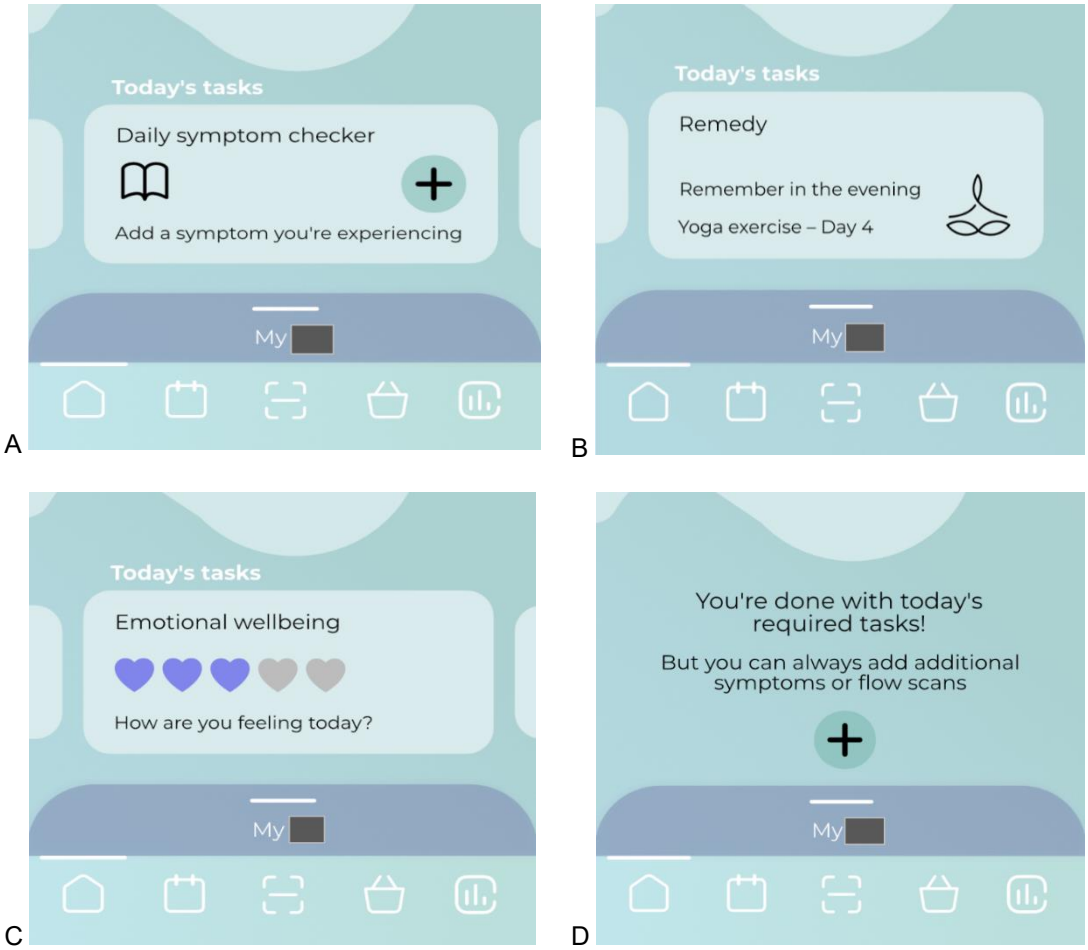


Figure 15. Different tasks presented to the user in the Today's tasks section. (Created by Ikune and used with permission).

4.8.3 Companion and personal tab

The core design goals with the application's companion were to have the companion provide the user with support, information, and help during their time using the application. This chat view could be accessed through the avatar of the companion seen in Figure 14. Displayed in Figure 16A is the basic use case of the companion. The user has opened the companion's chat screen and the companion reminds the user to complete a daily task they have been assigned. The user can either tap on the plus-sign to enter symptoms, quickly report that they have not had any by tapping on the 'I don't have any symptoms' option, or entirely skip this task this week through the final chat option. At the bottom of the view the user is also provided with a text input field, which prompts the user to enter a question if they have one. The user could ask for help with using the application or could ask about matters related to their cycle or symptoms and receive additional information.

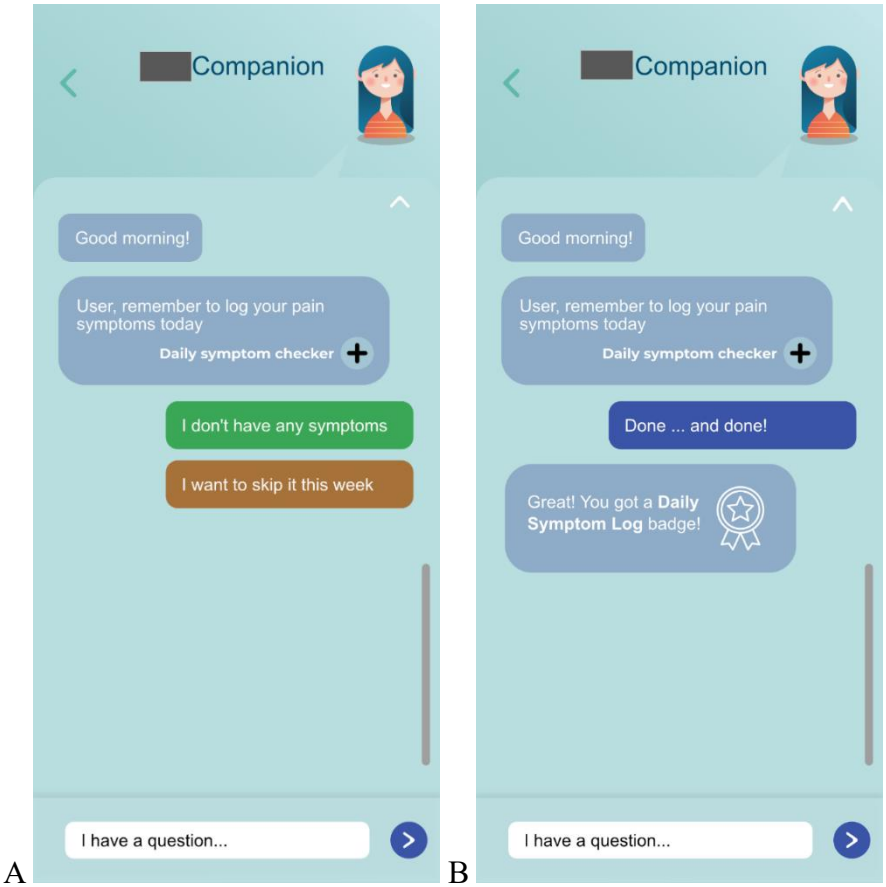


Figure 16. A) Companion chat view and B) The companion rewards the user with a badge. (Created by Ikune and used with permission).

Figure 16B presents a continuation of the situation from Figure 16A. In Figure 16B the user has completed their daily task as instructed by the companion. In response the companion gives the user a brief congratulation, and rewards them with a collectible badge. This badge is related to the activity the user just completed, logging their symptoms. The user is now free to ask the companion any questions they might have, or they can return to other parts of the application.

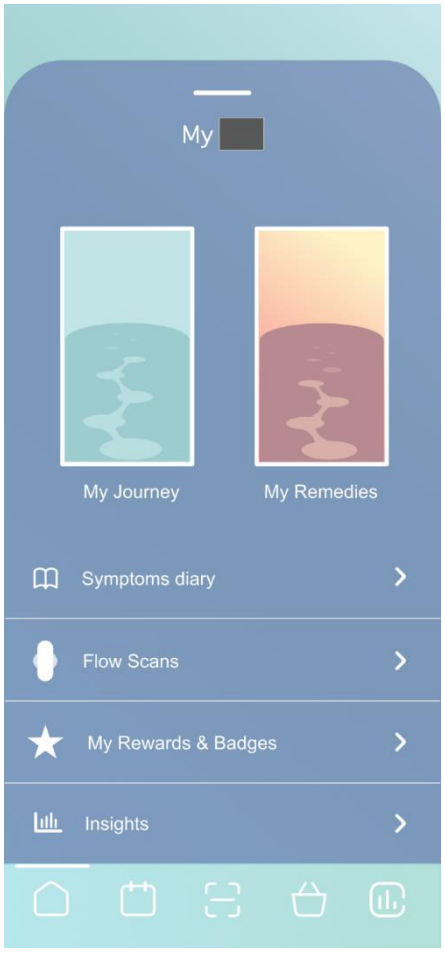


Figure 17. The user's personal tab. (Created by Ikune and used with permission).

Figure 17 shows the design of the user's personal tab. This design is a continuation on the design in Figure 7B. The tab contains access to pages that are connected personally to the user, containing features tailored for them and information about the data they have chosen to enter or information about things the user has unlocked. Tapping on either My Journey or My Remedies takes the user to the respective screen, the design of these will be showcased in later figures. The Symptoms diary and Insights pages remain on the same level of design as showcased in previous figures. My Rewards & Badges page has been designed as a new addition and is showcased in Figures 18A and 18B.

4.8.4 Rewards and unlockables

The implementation of badges in showcased in Figure 18A. The My Badges page shows the user all the possible collectible badges, along with the ones they have already unlocked. The badges in Figure 18A were found to be somewhat boring in the user study, and a suggestion was made to create more visually interesting badges. The functional logic of badges is quite simple: performing certain tasks within the application rewards the user with a badge. Badges are related to different topics, such as progress, flow scans, and symptom logs as visible in Figure 18A. Badges also contain a challenge aspect to them, the first badge is very easily collected, such as by the user performing their first scan or symptom log, following badges will however be consequentially harder to unlock and require more effort. Badges can help motivate users, acting similarly to challenges (Paajala et al., 2022).

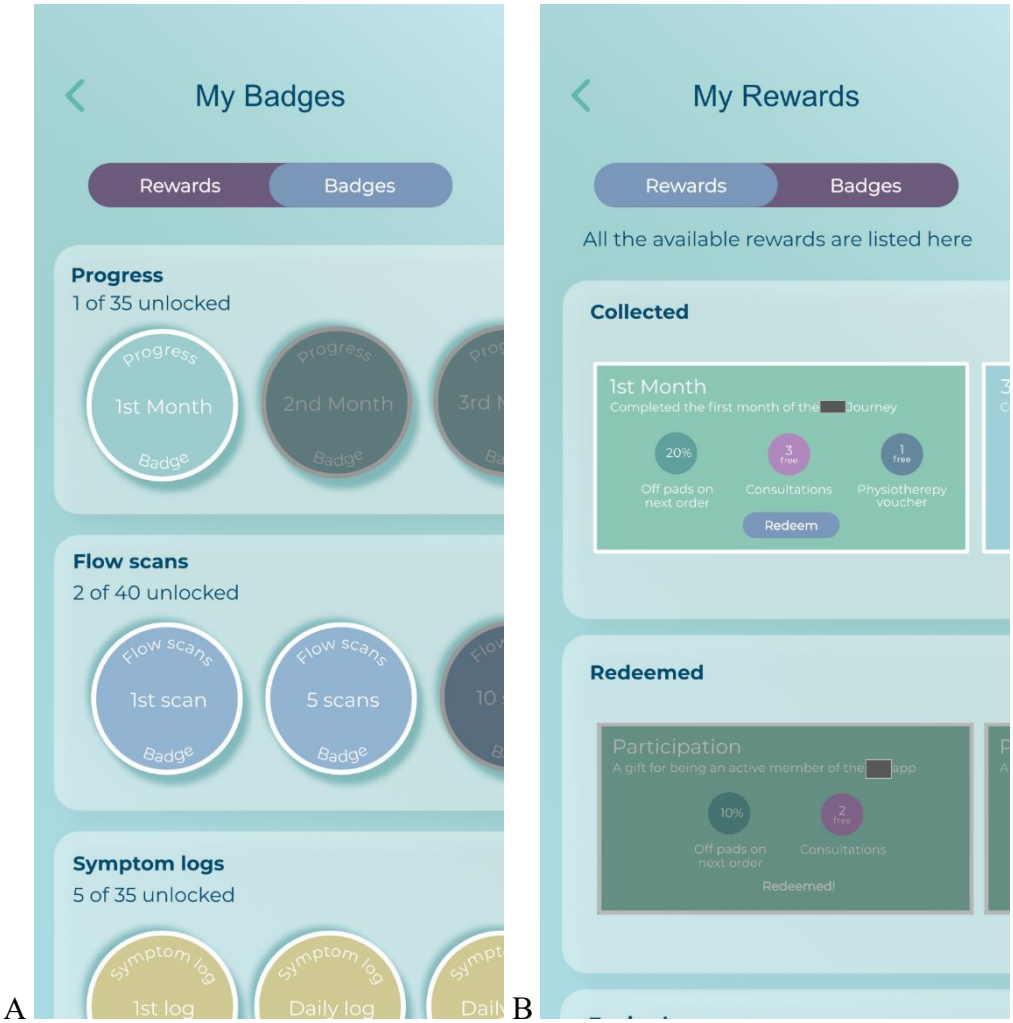


Figure 18. A) My Badges page displaying the various badges the user can and has collected and B) My Rewards tab listing the collected and redeemed rewards of the user. (Created by Ikune and used with permission).

The application was envisioned to contain many forms of rewards to the user for frequently using it. One type of reward was already showcased in Figure 18A, that being the various badges. Other potential rewards included percentage discounts on products the customer planned to sell, real-world consultations with healthcare professionals, and other potential free vouchers and discounts. The view in Figure 18B is split into Collected and Redeemed rewards. Redeemed rewards represent rewards the user has already spent, while Collected Rewards are rewards the user has not yet redeemed. This view is accessed through the My Rewards & Badges button seen in Figure 18A. The view in Figure 18B also contains a tab structure, one tab dedicated to the rewards, the other to the badges shown in Figure 18A.

4.8.5 The Journey

Figure 19 presents the newly designed Journey. The Journey is a feature that allows the user to track their progress through the desired use period of the application. Ikune's customer aimed to successfully diagnose endometriosis by having users use their application for six months. As per the comments in the user study, rewards have been added to months 2, 4, and 5 to entice the user to keep using the application.

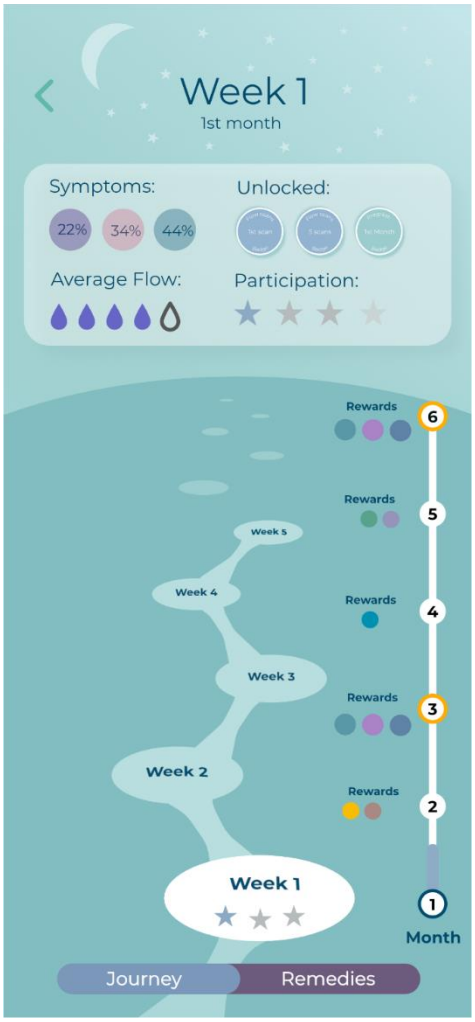


Figure 19. Design of the Journey screen. (Created by Ikune and used with permission).

The current week and month of the user using the application are displayed at the top of the screen in Figure 19. Beneath this time tracker is a box displaying the user's most commonly experienced symptoms, badges they've unlocked this week, the average flow level of the week, and the participation level of the user. Participation indicates how actively the user has completed their daily tasks. Below the box containing this information can be found the main part of the Journey, the steps. The week indicators in the steps of the Journey were designed to mimic footprints to indicate progress as the user progresses to the next step each week. Each week's step also showcases the user's participation levels, rated from one to three stars. To the right of the Journey's steps can be seen a longer-term progress indicator. This showcases which month of the Journey the user is currently on and their progress towards the next month, while also showcasing some of the upcoming rewards for reaching the following months. Greater rewards are provided upon completion of the first, third, and sixth months, while the second, fourth, and fifth month provide smaller rewards. The constant flow of rewards should keep the user better engaged using the application, while the bigger rewards give the user something to look forward to and work towards.

4.8.6 Unlockables, remedies, and weekly reflections

Alternative avatars for the user's companion were included in the application in the form of unlockable rewards. This gives the user the ability to customize their application to their liking. The ability to customize was considered an important aspect by Epstein et al. (2017). In the final application locked avatars should ideally display their relevant

silhouette, rather than the silhouette of the first unlocked avatar. As instructed in the design in Figure 20A, additional avatars are unlocked through completing daily tasks and progressing in the Journey.

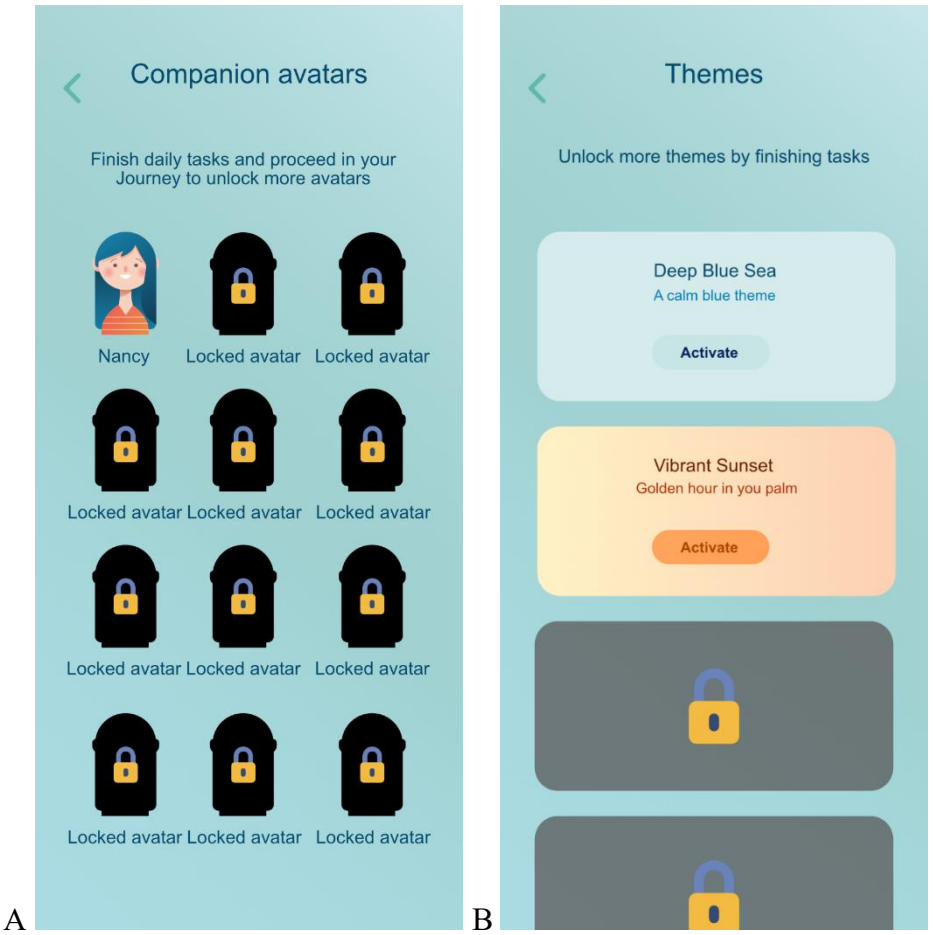


Figure 20. A) Screen allowing the user to change which avatar their companion uses and B) Screen showcasing locked and unlocked themes the user has access to. (Created by Ikune and used with permission).

Figure 20B displays another way the user can customize the appearance of the application. Adding various colour themes to the application allows users to easily customize the application to their liking, while also providing the user with interesting unlockable content. Themes, like companion avatars, can be unlocked through completion of daily tasks and progress on the Journey. Pictured in Figure 20B are two alternative themes, a calm blue theme, and a vibrant yellow theme. It is important to keep in mind recommendations by Epstein et al. (2017), who state that colour design should be discreet by default, or at least a neutral non-obvious interface option should be provided. Assuming users have one or two unlocked themes at the beginning of using the application, at least one of these should be in line with the recommendation of Epstein et al. (2017).

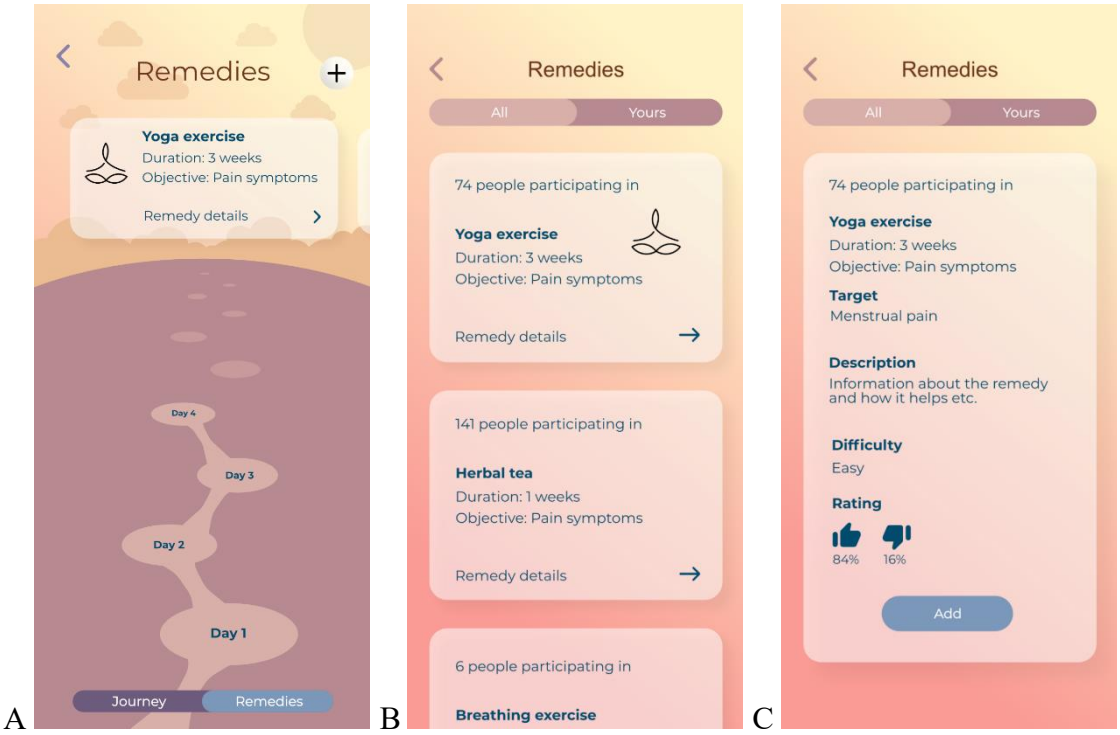


Figure 21. A) The Remedies screen, B) Listing remedies with additional details, and C) Detailed view about a remedy. (Created by Ikune and used with permission).

Remedies are offered in the same menu as the Journey, seen in Figure 19. The Journey and Remedies are split into their separate tabs. Remedies were designed as a community-driven feature, where users of the application can share remedies, they've personally found helpful. Remedies are different kinds of actions, that aim to help the user alleviate different symptoms they may be experiencing. Figure 21A showcases the basic remedy screen, similar to the Journey. Figure 21B displays additional information about remedies, showing the user how many people are participating in each remedy, the name of the remedy, the duration of it, and what the remedy aims to help with. The view contains a tab splitting the remedies into all remedies and the user's remedies. Additional details can also be accessed through 'Remedy details', leading the user to the screen in Figure 21B. Displaying the number of users currently participating in a certain remedy helps give the remedy more social proof.

The detailed view of a singular remedy is presented in Figure 21C. This view shows the user some same information as in Figure 21B, such as the number of people participating, name of remedy, duration, and the objective. Additional details presented to the user include the target symptom the remedy seeks to help with, a brief description of the remedy, the difficulty of performing this remedy, and finally the total rating the users have left on this remedy. The user can also add this remedy to their remedies they are partaking in by tapping on the 'Add' button on the bottom.

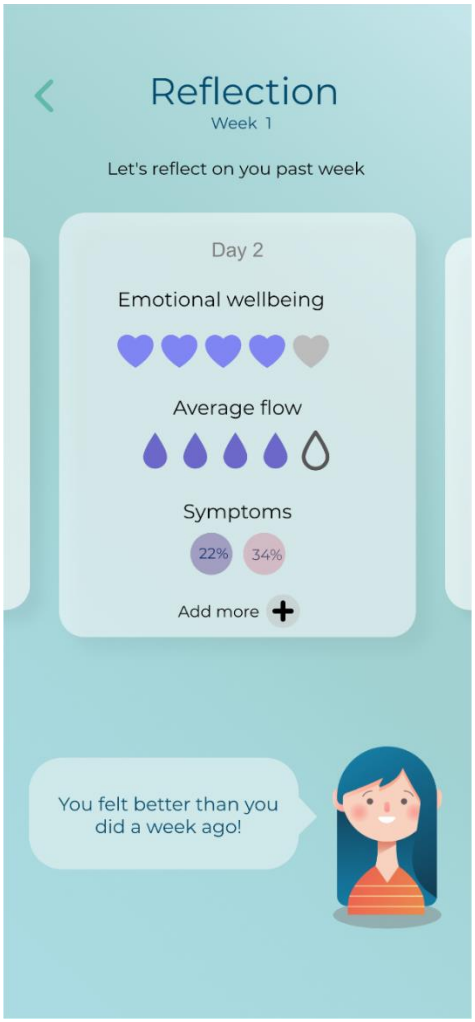


Figure 22. The user is presented with a weekly reflection. (Created by Ikune and used with permission).

As an additional feature in the final design phase a reflection system was added. In this the user's companion would present them with an overview of the past week. The user can see their emotional wellbeing over the past week, average flow levels, and symptoms they most experienced. This feature allows the user to better follow their progress. The users could even be presented with a monthly reflection at the end of a month, to see how their symptoms and average situation has changed throughout the month.

4.9 Company's experiences of the research visit

A feedback interview was conducted at the end of the research visit. The goal of this interview was to explore how successful the interviewee considered the research visit to their company to have been. The interview was conducted on the 22nd of December 2022, at the University of Oulu. The duration of the interview was approximately 33 minutes. Questions in the first part of the interview focused on the overall success of the research visit that had taken place during the summer and fall. The second part focused on potential future research visits. Permission for recording the audio of the interview and permission to use the results in this thesis were obtained at the beginning of the interview.

The interview began with questions relating to the research visit that had taken place. This section began with the benefits and challenges of the visit and anything the interviewee wishes would have been handled differently during the visit. The most useful contributions made during the visit according to the interviewee consisted of participating

in the UI design process and brainstorming of functionalities. Background and familiarity with games was also a benefit despite not being directly linked to gamification. The interviewee stated that it was better to have lots of ideas early to figure out which ones were best and worth further developing. The user study arranged during the visit was also considered valuable by the interviewee. Generally, the interviewee felt that there were no issues or slowdowns that would have been caused by the research visit. They stated that during the visit the project was joined quickly, and useful contributions began early.

The interviewee experienced the visit positively and felt that it progressed smoothly. In general, they felt that the visit process was successful. They noted that the ending of the visit could have been handled slightly better, as collaboration mostly slowly died down and the interviewee did not wish to be an interruption, as studies had resumed after the summer. The interviewee stated that they purposefully started involving the interviewer less to allow for more room for studies. The interviewee's company was working on a 6-month project and visit happened largely during the early stages. The interviewee felt that the duration of the visit was good but in the future visitors could also remain for the whole project. The visit was also timed well as it happened right at the beginning of the new project. Generally, the interviewee only desired for visits to not happen during Christmas. The interviewee also stated that summer works well as they don't really have a summer vacation, students are free from their studies, and summer is generally a calmer time. The interviewee also stated that they would be open to future collaboration projects with the interviewer.

The second part of the interview focused on future visits, whether the interviewee wants future visitors, what the interviewee would aim to do differently, and what they would wish for in future visits. Firstly, the interviewee saw research visits to be useful. They stated that many of their projects are research focused and there is lots of background research to be done. They also hoped to combine these projects with their work towards a doctorate. In case the visit focuses on the interviewee's company's projects visitors could also help with developing prototypes of various project ideas and help test them.

The interviewee stated that students undergoing their master's studies are good candidates for visitors. Students that would have recently started their studies in the bachelor's program may lack necessary knowledge and struggle. Experience with project work was mentioned in a positive light. In general, the visitor's skill levels were good for a research visit. The same applies to the personality of the visitor, the interviewee wished for a visitor that is motivated regardless of the project's topic and willing to potentially spend their own time on the project. They did not desire slackers to join their projects and stated that their expectations had been met well. From the view of their company, they valued visitors that would give them tangible results and that helps them progress in their projects. The interviewee stated that the visit resembled more of an internship with the visitor doing some research tasks but also participating in many tasks that were not directly linked to research.

When questioned if the field of study of the visitor matters the interviewee stated that sharing a background in the field of information processing science was viewed positively. For this research visit the interviewee could have also imagined that another background could have been useful. The interviewee suggested that a background in health or psychology studies could have also been fitting. Projects focused on serious games also aim to educate the players, so a background in pedagogy could be useful. This shows that despite the company's focus on games, a background in programming, games, or information processing science is not necessary. However, sharing a background in information processing science gave the interviewee a good idea of what sort of skill level

to expect. Their company had also provided topics for project courses earlier, which gave them more understanding of the rough skill levels of the students. The background in information processing science did positively impact the interviewees attitude towards the visit, along with the traineeship at INTERACT and an existing personal connection to a university teacher. Enthusiasm towards working together in meetings in the early stages also played a positive impact.

5. Findings and discussion

The following chapter will focus on the results of the studies, answers to the research questions will be sought through the presented results. The research questions and relevant studies will be discussed in numerical order, starting with research question 1 and study 1, followed with RQ2 and study 2.

5.1 Answers to research question 1

The question posed as RQ1 was:

> *What sort of collaboration needs and wishes do game development companies have for university students?*

An answer to this question was sought through Study I where game companies were contacted for identifying their needs for collaboration with university students. A semi-structured interview with a game company representative was conducted.

The key findings were collated from the interview conducted in Study I, and the feedback interview at the end of Study II. These findings are two-fold: one view discussing the technical knowledge requirements of students or other collaboration partners, and the other on what forms of collaboration were most useful and convenient to the company.

The personal skills of students the interviewee's company looked for consisted of skills related to game development or proving one's abilities through showcases they had created. Key skills the company looked for included Unity development, skills in different programming languages, general skills related to game development and game design. Skills somewhat indirectly related to game development were also mentioned, with the interviewee bringing up graphical skills. A general interest into programming was also valued, ideally considering it a hobby. The interviewee noted that relevant skills should be showcased through a portfolio consisting of various self-driven projects, such as simple games. (Study I)

Experiences of Study II showed that the visitor should ideally be undergoing their master's studies or close to it. A student still in the early years of their bachelor's studies may have lacked relevant skills. The personality of the ideal research visitor also mattered, stating that an excited and driven collaborator was preferred. The interviewee did not consider a background in information processing science mandatory for a successful research visit, stating that depending on the project at hand other backgrounds could also be useful. A familiar background in information processing science however was useful for getting the research visit off the ground, as did enthusiasm towards the project during our earliest meetings. (Study I, Study II)

The benefits the company sought to gain for themselves were focused on networking, convenience, and additional resources. Project courses were seen as an especially useful form of collaboration, as the company gets an opportunity to have their projects developed further utilizing student resources. This also provided the company with an opportunity to scout student talent, potentially finding especially talented individuals to employ in their company or join additional projects later. Providing thesis topics was also found useful and served similar purposes. (Study I)

The interviewed company valued the possibility to prototype ideas they had had with student resources, allowing them to explore more ideas without salary costs. The interviewee also stated that the company is often too busy with other work to fully explore these ideas. Talent scouting and networking with the university and students were also considered very beneficial. These both allowed the company to try and find more talented collaborators or even potential employees. Networking also allowed the company to better discover more useful contacts, and potentially join relevant and useful research projects. (Study I)

The feedback interview after the research visit revealed that the most important contributions during the visit were participation in the UI design process, and efforts in developing the features of the application. A background in the field of games was useful despite not being deeply related to gamification. Contributions to early phase brainstorming were also useful, as having lots of ideas made it easier to probe which the customer likes. The interviewee stated that the visit did not cause any slowdowns or negative side effects and they were open to collaboration in future project. Additional research visits were also considered a good idea and the interviewee saw these as a useful addition.

5.2 Answers to research question 2

Research question 2 was targeted towards the second study of this thesis. The question posed was:

> *What are important considerations in designing menstrual cycle self-tracking applications?*

Answers were found during a research visit to Ikune Ltd, during which gamified features were designed for a customer project. Two semi-structured interviews were conducted during a user study, which explored the level to which the participants accepted gamification in this application context, and what features they deemed important in such applications.

There were plenty of important discoveries made in these interviews. Many of the findings supported what prior literature suggests, however new comments were also discovered. The interviews highlighted the importance of customizability, as participants desired colour theme, level of gamification, and use purpose to be customizable. Use purpose could be implemented by allowing the user to customize what they want to accomplish by using the application, such as pursuing or avoiding pregnancy. Customizability was also suggested to help each user group find the application suitable. The promotion of customizability was in line with the recommendations made by Epstein et al. (2017). Privacy and security were deemed important through the interviews, with the participants desiring an application that echoed security and made them feel safe in using it.

The participants also noted that the utility the application provides to the user is key. Applications should collate data users input and provide the users with new information and value based on their entries. Participants desired to see the application provide them with useful graphs and interpretations about the data they have entered. The application should also alert users to abnormalities in the data. Participants promoted reliability of predictions and suggestions, along with effortlessness, ease of use, and usability. Visual elements were also considered important. Visuals should aim for a neutral tone, which is not overly pink or otherwise feminine, while also ideally providing the user with

customization options. This finding also aligns with the recommendations of Epstein et al. (2017).

Generally, participants saw the suggested features positively. The features included were the remedies, which were user created suggestions to help with menstrual symptoms, the pad scanning feature, which received a neutral welcome but was not rejected, ideas of educational content and social interaction were also considered reasonable. Gamification was generally accepted, with a promotion of customizability. The participants suggested that users could customize how many gamified features they want in the application. One participant also suggested that the menstrual cycle is not a disease, so the topic could be approached as a game or more light-heartedly. Light-heartedness and an overall positive demeanour were also desired for the application, with participants stating that the application should feel "like an old friend" and provide positive, supporting messages. Participants desired in-application rewards monthly or more frequently.

The acceptance towards gamification from both participants is an important finding, as feedback from the Endo Warriors support group indicated them to be against gamification. Of course, this depends on the implementation of gamification. Despite referring to games and gameplay, gamification can still be implemented in a serious manner suitable for an application aimed at medical use cases or medical interventions.

Participants had experience with chatbots and felt they were useful additions. However, having a warm and positive appearance was expected. Chatbots should also not feel intrusive, and the user should always have full control over how long they wish to interact with them. Participants were split on the topic of a digital pet, finding it cute and interesting, while also questioning if it could act as the user's guide. Implementing the pet without chatbot-like features could allow for both to be incorporated.

Participants considered badges and streaks good gamification features in such context. Badges should however be unique and interesting to entice users to collect them. The ability to unlock new customization options, such as companion avatars or colour themes were considered good rewards. Participants also felt that some form of social connection within the application would be a good addition. One participant preferred simply finding and adding your friends and chatting with them in private, while the other participant felt that a larger-scale, anonymous chat forum could be a good feature. The ability to view which remedies friends are partaking in was seen as a good addition.

Another important feature highlighted by a participant was the ability to retroactively add entries into the application. Accidentally creating wrong inputs or the user forgetting to input their phase of the cycle could lead to issues with applications. The applications would predict the user's menstrual cycle incorrectly and users seemingly had little ways to fix this. The prediction accuracy of the application was therefore considered important and a key part of applications. Epstein et al. (2017) also promote the importance of high accuracy in predictions.

Other interesting suggestions brought forth by the participants included the inclusion of educational content within the application, possibly through the user's companion, and a connection between the user's real-life menstrual cycle phase and recommendations for actions related to the phase. A participant suggested educational content, stating that Finland has very high standards and education when it comes to such topics, but many countries do not. They saw the application as a way of spreading more basic information related to the topic, noting that in some countries these topics are not discussed. The other participant had discussed the bodily function differences between various menstrual cycle

phases with their friends and wished to find real scientific research related to this topic. An example of what they described is presented by Helm et al. (2021). The participant desired the application to make suggestions relevant for the stage of menstrual cycle the user was in, which could serve as an interesting new feature. Background research into menstrual cycle tracking applications during time at Ikune did not find similar features in other applications. Epstein et al. (2017) recommend supporting the ability to journal and track other variables, like mood and stress, alongside the menstrual cycle as a correlations can possibly be made cycles and other aspects of users' lives. This finding could be combined with the ideas of self-experimentation discussed by Choe et al. (2014). Menstrual cycle tracking applications could attempt to provide users with some level of self-experimentation, where users could see how stress and other variables affect their menstrual cycle or vice versa.

Participant #1 also brought up the difference between electronic and more traditional tracking on pen and paper. They noted that tracking on paper felt more organic, personal, private, and like they were doing it on a more delicate frequency. This begs the question if electronic tracking could somehow replicate tracking physically on paper and evoke similar feelings of delicacy and being organic.

Participant #1 saw different modes in applications useful. Modes referring to the user's goal in using the application, such as aiming to avoid or reach pregnancy. This finding is once again supported by Epstein et al. (2017), who also promote the importance of supporting varied and chancing reasons for cycle tracking. Participant #2 noted that the application seemingly simply repeated to the user what they had already input, rather than utilizing the data and providing some form of analysis, creating similarities to the findings of Choe et al. (2014). The previous finding also supports Karkar et al. (2015), who stated that applications may fail to provide users with actionable feedback. The provision of additional value to the users of these applications is a useful finding.

In line with Epstein et al. (2017) the participants saw it as a good idea to avoid strongly feminine colours, and they preferred more neutral tones. Participant #2 even stated that *"...pink would be very bad*." The participants generally put weight on the possibility to customize the appearance of the application and considered it a good feature.

5.3 Implications for academy and practice

This chapter covers what impacts the findings of the presented studies may have for the future of academia, companies, and practices. A key part of Study I was to provide university students with a better understanding of the talents and skills desired by game development companies. In the field of information processing science, it is not unusual for students to desire to one day find employment in the field of game development. This study can potentially help students collect relevant skills during their studies. The results can also help universities offer students relevant courses to develop these skills.

The outreach during Study I received very few responses, which provides its own implications. There could be several reasons for game development companies not wishing to partake in the study. Perhaps they were simply too busy or saw the opportunity for university collaboration as something they were not interested in. Companies may have poor experiences with previous collaboration or be reserved and not wish to get involved in something they are uncertain about.

Study II provides useful guidelines for the development of similar future applications. Table 1 contains considerations collated from the findings of Study II. Many of the

findings of Study II were in line with existing literature. Interesting and unique findings were however still made, such as the participants openness to more experimental features, and the importance of the application's warm personality, and reduction of mental load on the user.

Table 1. Considerations for future application development.

	Consideration	Explanation
1	Gamified features	Despite the medical nature of the application the participants were in support of gamified features. Implementation should still be studied and considered case by case.
2	Customization	Allow users to customize various aspects of their experience, including but not limited to colour themes, number of gamified features, and user goals. This could include how frequently the user inputs their cycle data into the application.
3	Provide value to user	Utilize the data the user inputs and provide the user with interpretations and graphs of the data. Provide user with more than they could see from the data itself.
4	Visual style	Aim for a neutral, clinical colour theme. Avoid overly feminine themes, such as pink. This helps the application not draw bystanders' attention.
5	Prediction accuracy	Give the user ample tools to retroactively log their data or to edit their previous entries. This helps the user correctly input their data, helping the application make more accurate predictions.
6	Chatbots and pets	Generally accepted. Should be implemented in a warm and supportive way. These features should not be intrusive, and users should be easily able to determine how long they wish to interact with them for.
7	Experimental features	More experimental features were accepted by the participants, possibly due to them being presented as a method of medical intervention.
8	Support varied and changing tracking reasons	Allow users to choose what goal they wish to pursue in using the application and have the application customize the user's experience according to their selection. Allow this to be changed later if the user wishes.
9	In-app rewards	Rewards can include unlockable in-application content and things like badges. Rewards also serve as an important motivator and should be given to the user regularly. Badges should aim to be unique and visually interesting.
10	Ease of use, reducing mental load of user	Application should ideally be easy and quick to use. The application should also aim to make things effortless for the user and reduce their mental load.

Key findings in Table 1 include providing the user with as many benefits as possible. This can be condensed into the applications being easy to use, along with reducing the mental load users have to put into the use of the applications and the process of tracking their cycle in general. These applications should also help the user reach interpretations and possibly recommend practical actions in the form of self-experimentation based on the data the user enters.

The study found that gamification was considered acceptable, despite the topic being connected to something very intimate and having a medical background. Practical functions included a wide variety of customization options, acceptance of chatbots and virtual pets, so long as they are warm and supportive, and the user retains control over when and how these features interact with them. More experimental features were also accepted, namely the pad scanning. This is possibly due to the feature seeming like a

medical intervention. The ability to customize the application based on the user's desired goal and reason for tracking their cycle was also important. This should be accompanied by the ability to also change the reason later. Varied rewards were also considered important and could be for example cosmetic upgrades for the companion or pet, badges, or customization options such as colour themes. Additional important considerations for such applications also include a neutral, possibly clinical colour theme, and high level of prediction accuracy.

5.4 Limitations

This chapter briefly describes the limitations associated with the studies presented in this thesis. A clear limitation to Study I is that despite attempts at reaching out, only one participant was recruited for this study. Despite this limitation the qualitative interview presented in the thesis brought up important and noteworthy findings. Alternatively, this research question could have been answered through literature. This approach was however abandoned due to the desire to investigate practical needs of game development companies and find additional topics of research through these needs.

A limitation related to Study II is that due to time constraints only two participants were managed to be recruited for the study. The original vision for this study was to arrange one or more three to five participant focus group sessions but due to schedule limitations from the customer company a faster approach had to be adopted. Due to these limitations the participants were convenience sampled. The qualitative user study however provided enough material for analysis and relevant findings to be collated.

There is also a key limitation related to both studies presented. The analysis for both studies was done by the author alone, which may have led to subjective conclusions or other errors may have been made that have not been noticed.

6. Conclusion

This thesis has consisted of two separate studies, aiming to provide answers to the following research questions:

RQ1. What sort of collaboration needs and wishes do game development companies have for university students?

RQ2. What are important considerations in designing menstrual cycle self-tracking applications?

Study I aimed to answer RQ1 by contacting game development companies in Finland. Contact letters were sent out to seven distinct game development companies. This outreach gained one response. A qualitative interview study was conducted with a representative of the respondent company, which provided enough material for analysis and formulation of answers to the research question. Briefly summarized, the respondent valued knowledge of programming languages, general enthusiasm towards the projects of the company, other skills related to game development, such as graphical skills, and students being able to showcase their talents through a portfolio of projects. The benefits to the company included ability to scout students for talent, better networking with the university and students, and the ability to have access to additional resources through student work by providing course assignments.

RQ2 was answered through a literature review and an empirical study, during which a research visit to Ikune Ltd. was conducted. During this research visit UI design concepts were designed iteratively, in combination with a qualitative user study related to these concepts. During the research visit Ikune was involved in the development of gamified features for a menstrual cycle tracking application, which aimed to hasten the diagnosis of endometriosis. The research visit focused on aiding Ikune in designing these features, along with UI prototyping. Several features were brainstormed and developed to the UI level during this visit. During this development process a user study was arranged in order to gain feedback on the design ideas. The user study presented in Study II consisted of two participants. Despite this low number of participants due to schedule pressure from the customer company, the user study provided useful findings for the continued development of the application, and in order to answer the research question. Summarized, the participants indicated that gamification first of all could be incorporated, as even this was not certain during the project. Despite the sensitive nature of the topic, the study participants did not see gamification as disrespectful or otherwise unsuitable. Secondly, participants provided positive feedback on having a virtual companion, providing the user with rewards frequently through for example badges, the participants were also open to more experimental features if they were grounded in a medical background. The idea of a virtual pet received overall mixed feedback during the study and the project at large, which lead to the designing of a more human-like companion. The results of this study were collated into Table 1, providing several design suggestions for similar applications.

The study also brough up several topics of interesting future research. Research should continue into studying the usage of similar applications with various user groups. Namely the differences between user groups separated by age and groups where the application could provide more tangible benefits for health and wellbeing. Future study with participants diagnosed with endometriosis could also provide interesting findings. Another possible topic of future research could be the inclusion of a virtual pet. During

this study gamification and virtual pets received both support and resistance. Findings of Study II however indicated that the participants were open to more experimental features and were in general not opposed to features of gamification. Therefore, the inclusion of a virtual pet may have worked and should still be further researched.

Other possible topics of future research that came up during the study were the following. Firstly, it could be a possibility that the popularity of video games helps, and has helped, grow the popularity of gamification. It may be worthwhile to study whether the growth of popularity in video games has led to an increase in the use and implementation of gamification. A key part of video games are uncertain outcomes, with the player unaware of how situations are going to be resolved. A topic of research could be whether gamification could be improved by incorporating more uncertain outcomes. Currently gamification seems to offer only very predictable end results.

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Appendix A. Business Contact Letter

Greetings, *name of business*!

I am an information processing science student from the University of Oulu. In May I started a traineeship at INTERACT, a research unit in my degree programme. I am contacting you as I have been tasked to find out the needs, research interests, and potential interest in cooperation with our university regarding courses, thesis topics, visiting lectures, and the like of gaming companies as part of my traineeship. I will also be conducting research based on the desires and needs of companies potentially interested in cooperation. During my traineeship I will also be gathering materials for my master's thesis.

Therefore, I am now approaching you to inquire if during my traineeship you would be interested in some form of cooperation, such as a survey on potential cooperation possibilities and/or doing a small study (such as a literature review, game testing, user survey, etc.) based on your needs?

I am interested in the gaming industry. In my bachelor's thesis I focused on investigating the effect procedural generation has on the replayability of video games through literature review. You can find my thesis as an attachment, but it is unfortunately written in Finnish. In brief my study found that games featuring procedural generation and similar elements are generally more replayable than ones without. My interest in games is specifically aimed towards replayability, such as which features make players replay games. The topic of my master's thesis can be customized either based off my bachelor's thesis or around your needs and wishes.

PhD Leena Arhippainen from my degree programme acts as instructor of my traineeship and is also the main instructor of my thesis.

My traineeship is to be completed during 25.5. – 25.8.2022. During June, July, and August my priority is to complete any potential cooperation related to game research or testing with your company in the scope of your wishes and timetable. Potential cooperation with a master's thesis topic can last longer if needed in order to properly finish the study and provide you the results.

I would be happy to further discuss these possibilities either in person, remotely or through email. I would prefer if you could indicate your potential interest at least by the 10.06.2022.

With gamified greetings,

Joonas Vuolukka
Bachelor of Science
Information Processing Science
Faculty of Information Technology and Electrical Engineering
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Appendix B. User Study Interview Questions

Menstrual Cycle Related Questions

1) Do you track your menstrual cycle?
2) How do you do it? Pen and paper, application, calendar, other?
3) Why have you chosen to do it this way?
4) When do you do it? Randomly, when your menstruation begins, after them?
5) Are there problems in this way of tracking? What kind?

Tracking Applications

6) Do you have experience using menstrual cycle tracking applications?
7) If not currently using applications: what would make you use one?

Treatments (users were shown screenshots of the treatments UI)

8) Would you like to see suggested solutions to different menstrual cycle related symptoms in the application?
9) If users could create and vote on these treatments, would you feel comfortable trying them?

Screenshots (users were presented with screenshots of the Journey)

10) What do you like or dislike about these views?
11) How do you feel about the colour scheme of the application?

Gamification related questions

12) Gamification: game-like features in applications that are not games, such as points, levels, and so on (explanation of gamification in case participant is unfamiliar with the topic)
13) What do you think of including such features into menstrual cycle tracking applications?
14) Do you think an application like this can be fun or game-like?

Rewards & Badges (users presented with “My Rewards” & “My Badges” views)

15) The goal is to attempt to increase user retention and usage of the application (Why badges & rewards exist in the application)
16) Do these features help with that?
17) Do these features feel fitting in the application?
18) Do you think they are motivating or engaging?
19) What would motivate or engage you? Do you maybe have experience with other applications?
    a. Many possibilities: rewards, virtual goals, virtual pet or garden, etc…

Companion (Participants presented with Figure 13)

20) Do you have earlier experience with this sort of features?
21) Do you find them useful?
22) How do you feel about them in general?

Appendix C. User Study Informed Consent

Usage and impact of gamification in menstrual cycle tracking applications

This study is a key part of research for my master's thesis with a topic in using gamification to improve user retention and engagement in menstrual cycle tracking applications. Gamification refers to the usage of game-like features in applications that are not games. The purpose of this study is to find out if using gamification can improve user retention and motivation to keep using these applications.

The goal of this meeting is to gather information regarding participants' menstrual cycle tracking habits and their attitudes towards menstrual cycle tracking applications and gamification. Participation involves joining a remotely organized discussion moderated by me and Juho Mattila from Ikune Labs.

In the study any answers you provide will be anonymized. Any information or answers you have provided will be handled in such a way that you will not be recognizable from the study results. Only information relevant and necessary for the study will be stored and they will be held in possession of only the researchers. Once the research has been conducted and your answers are no longer required they will be deleted.

Participation in the study is entirely voluntary. You can refuse to participate, discontinue your participation, or withdraw your consent freely at any moment. Answers and information you have given during the session will not be used if you withdraw your participation.

Joonas Vuolukka

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