Collaborative Design Boosting Development of Digital Wellness Services

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ABSTRACT: *Today, digitalization is a catalyst for economic growth. Digitalization opens huge opportunities for service providers to create novel solutions for consumers. For example, consumers are willing to spend more money and time to take care of themselves and this provides new business for wellness service providers. The aim of this paper is to provide new knowledge on how user involvement and co-design can boost development of digital wellness services, and what are their potential benefits for companies. The paper introduces three case studies in which novel mobile wellness services were developed in collaboration with users in Owela platform in different phases of the development process.*

KEYWORDS -*wellness, mobile services, digital transformation, user involvement, co-design*

I. INTRODUCTION

Today, digitalization is everywhere and affects our everyday life enormously. Digitalization has had a transformational effect on production, services, and business processes around the world [1]. Earlier, digital technology was seen as a niche market for specialists but now it is merely an everyday technology that affects all sectors of the economy and society [2]. Digital technology is also accelerating economic growth. For example, in Europe the Big Data sector is growing by 40% per year, seven times faster than the IT market [3]. Digital transformation, combining digital technologies into business processes, has potential to renew business models, create new innovations and services.

Thus, digital technologies and the use of data for wellness and healthcare purposes offer huge opportunities for consumers, healthcare providers, and the industry, benefitting from the trend of consumers being willing to spend time and money to take care of themselves. Health and well-being are determinants of an individual's quality of life. Many corporations as well as government agencies have entered the digital health market. For example, in 2014 Google, Apple, Samsung, and Microsoft all announced plans for digital health initiatives [4].

This study was conducted as part of the Digital Services (DS) program (http://www.digital-services.fi). In the wellness theme of the program, it was concentrated on the development of mobile wellness services for consumers to expand the offering of the companies involved. For example, novel applications were designed for preventative healthcare providing consumers versatile knowledge of their health, and wellness status. This paper introduces three different case studies: wellness application for employees to support exercising during work, a game for activating memory, and an application for strengthening the relationship of couples. Potential users of these novel wellness services were involved in a collaborative design process together with developers of the digital services and researchers through an online Owela platform. Even though co-development of mobile services has been studied earlier [5], mobile wellness services are a fairly new application area. The main goal of this paper is to provide new knowledge on whether there are some user related issues that differentiate mobile wellness services from mobile services in general that need to be considered by the service developers.

The paper is structured in the following way. In the second section, background information about digitalization in general and its effects on developing wellness services are presented as well as the importance of user involvement in the development process. In the third section, the research method is presented and the services studied are shortly described. In the fourth section, the findings for all three case studies are introduced and the results are then discussed in section five. Finally, the main findings are summarized and concluded in the sixth section.

II. BACKGROUND

The Internet and, recently, mobile network infrastructures have promoted digitalization as the technological backbone of our society. Today, digitalization has changed the world considerably, affects consumer's everyday lives and is increasingly a significant part of company strategy. It has been estimated that the Internet and digital technologies have become more and more integrated across all sectors of our economy and society [2]. Digitalization has been stated to strengthen the existing business, create new business and increase the value of the products and services besides the user experience [6]. Furthermore, the potential of Information and Communication Technology (ICT) and digitalization to accelerate economic growth will have to come primarily from the use of these technologies by other industries in the non-ICT sector [7], like transportation, retail, public sector, banking and healthcare. It is expected that the number of digital applications will grow explosively from one million apps (2015) to 500 million apps until 2035 [6].

Digitalization in wellness and healthcare domains offers opportunities and new potential services for consumers, healthcare providers, and industry. For example, new digital solutions can provide users motivating ways to manage their health, and healthcare systems can improve their efficiency and cope with the increasing demand from aging individuals [8]. Services based on wearable sensors and mobile applications for individuals to increase physical activity, eat a healthier diet, better manage their sleep and stress, and engage in social lives with family and friends are increasing [9].

At the moment, digital services are increasingly being developed for the wellness sector as supportive activities of public healthcare, such as appointment services, health education, self-care, and information services. Many of these digital services provide enhancements for the original physical services without the need to exchange medical patient data. Furthermore, various digital wellness services such as Web services, mobile applications, or personal monitoring devices are designed for individuals to manage their own health and wellness. These types of health services are also expected to enable more cost-effective health promotion and disease prevention. In addition, personal wellness services have been found to support face-to-face interventions [10]. The data collected could potentially increase information sharing between individuals and healthcare professionals. However, because of the lack of interoperable ICT solutions and standards, most e-health and e-care solutions cannot benefit from the large potential of the internal European Union (EU) market. For example, the lack of technical and legal interoperability of information systems is limiting the use of data collected from many mobile wellness applications in the public healthcare systems since patient data cannot be easily transferred [3].

Mobile phones provide an important and promising platform for applications that support users in their wellness and health-related activities, as noted e.g. by Ahtinen et al. [11]. The use of technology for improving wellness and motivating users in their wellness activities has expanded remarkably within the last few years. More than 100,000 health and medical-related applications for mobile digital devices have been developed for commercial use [4]. Mobile applications may for example support and enhance user's motivation to exercise more, eat healthier, lose weight, relax and care for their mental health. In addition, a range of other digital products currently on the market can be worn on the body to self-track biometric data. Such body functions, sensations, and indicators as blood glucose, body weight and body mass index, physical activity, energy expended, mood, body temperature, breathing rate, blood chemistry readings, and neural activity can be monitored using portable wearable and internal sensors that have been placed in wristbands or headbands, woven into clothing, laminated on ultrathin skin interfaces, or even inserted into ingestible tablets that can monitor the body from within.

Ahtinen et al. [11] formulated four user-centric design principles that are relevant in designing mobile wellness applications: 1) Be my advisor, 2) Acknowledge my efforts, 3) Grow with me, and 4) Keep me engaged. The results indicated that these principles are relevant in the design of wellness applications for motivating physical activity but must be adapted to individual needs and local context. Mattila et al. [10] listed the key requirements for personal health technologies: ease of use, simplicity, integration in daily life, and clear feedback.

In recent years, technology has been increasingly utilized for motivating users and providing support for various individual and collective beneficial behaviours. Perhaps the most popular development in this area has been gamification, which has been implemented in various contexts, including well-being. Gamification

refers to technologies that promote intrinsic motivations for various activities by employing the design characteristics of games. Previous studies outlined positive effects from utilizing gamification elements in digital exercise and health services, such as physical activity and healthy eating habits[12].

Companies are increasingly interested in collaborating on innovations with customers and users [13]. User involvement is expected to lead to more accurate user requirements, features that meet users' needs, increased acceptance of the system, and enhanced ease of use [5, 14, 15]. Customers are also expected to add value to the product or service when they are involved in the co-creation even during the early phases of the innovation process [16, 17]. The greater the consumers' role in the innovation process, the higher the product quality and the likelihood of its success, since consumers' own ideas are more likely to be valued by them [18].

In addition, users do not accept the role of passive consumers anymore but look for opportunities to contribute to a better world and better products, becoming active co-designers [19, 20]. This is largely due to the fact that social media has become a part of everyday life; it is used for communicating among friends and family, organizing events, sharing opinions, and collecting the power of individuals to act together. Consumers feel more empowered whether it comes to media, consumption, innovation, or civic participation [21]. Designing mobile wellness applications requires a multifaceted approach that combines wellness service design with knowledge of the technological possibilities. In this study, we aimed at a practical approach in which companies could test agile ways of service development in different phases of the development process.

III. METHODS

In this study, qualitative case study approach was chosen. This article provides evidence from various single-case studies. A case study research approach [22] was selected as the literature on user involvement and co-design of mobile wellness services is not yet well-formulated. Järvinen [23] emphasizes the ability of case studies to examine complex and not repeatable circumstances and, in this way, to gather information for the creation of new knowledge. Furthermore, case studies are especially appropriate when the context is expected to play a role in the phenomena of focus, or when effects are expected to be wide-ranging or to take a long time (e.g., weeks, months, or years) to appear [24]. In addition, the case study methodology has been stated to be well-suited for software engineering research, as it typically studies contemporary phenomena in its natural context [25].

The main goal of this paper is to provide new knowledge based on experiences in co-design in developing novel digital wellness services. The research questions for this research are as follows:

Q1. What are the important issues that need to be considered while developing mobile wellness services in comparison with mobile services in general?

Q2. What kinds of concrete benefits can be gathered from involving potential users of the service and developers in different phases of the development process?

3.1 Owela tool

An online Open Web Laboratory, Owela (http://owela.fi), was utilized in the three case studies presented in this paper to involve potential users in the collaborative design process of the wellness services. Owela is an online innovation space which helps companies to develop products and services together with their users [26]. Owela supports active user involvement in the innovation process from the early ideas to piloting and actual use. The Owela platform is technically based on the open source content management system WordPress and is a constellation of plugins that can be flexibly taken into use, depending on what kinds of features are required in each project workspace. At the moment, Owela has thousands of registered users. The Owela user database can be used for recruiting participants for new projects among those users who have expressed their willingness for further participation and whose profile match with the target group of the new project. Owela consists of blog-based discussion tools, user diaries, chats, questionnaires, and polls that can be combined for different innovation and design purposes. Owela can be utilized to involve users in all phases of a development process for an innovation, see Figure 1.

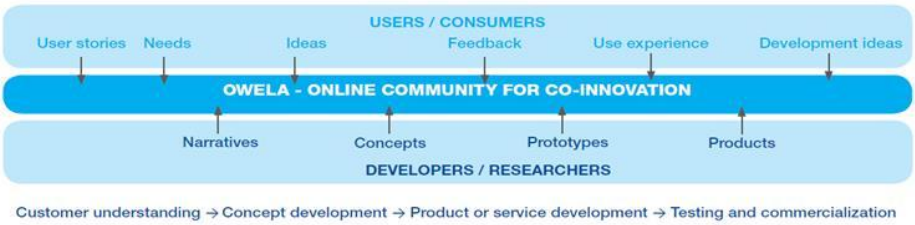

Fig. 1. Use of Owela during the phases of the innovation development process.

In the previous projects it has been found out that Owela makes it possible to quickly and cost-effectively evaluate different versions of possible new services with potential users [27]. It has also been very useful for companies to create rich interaction with consumers in Owela to identify the needs and expectations of their potential customers that provide the basis to build novel services with superior user experience [28]. Owela can be utilized as a part of a design process and can be combined with other participatory design methods like workshops, scenario work and interviews and face-to-face discussions [29].

In this project, Owela was utilized to gather information about users' attitudes and expectations towards three different mobile wellness services to give feedback and guidance on how the services should be developed. Table 1. summarizes the differences in the three services studied, identified as Case A, B and C. The services were in different development phases, and therefore there were differences in how the services were presented to the users.

Table 1. Summary of the mobile wellness services developed and evaluated in this study.

	Case A	**Case B**	**Case C**
Idea	Wellness service for employees	Memory game	Relationship Strengthening Method
Development phase of the service	Concept	Prototype	Nearly ready to be launched
Length of the study period in Owela	2 weeks	2 weeks	6 weeks
Number of participants	46	112	9 couples
Gender of participants M (%) / F (%)	57 / 43	48 / 52	50 / 50
Age variation of participants	30-90	18-89	27-47
Number of comments	225	325	90
Companies involved	Valmius Hyvinvointiin Group Oy (www.valmius.fi) and Innvolve Oy (innvolve.fi/en/)	Valitut Palat CIL Suomi Oy (http://www.rd.fi/)	Olento Life Ltd (www.olentogames.com/)

Users register on the Owela platform to participate in discussions but can create a user name and participate anonymously. Only researchers have access to the participants' personal data. In the case of wellness services, which deal with very personal issues user involvement is sensitive and their privacy has to be respected. Even though the developers were able to join the discussion with users, they were not able to access all data. The final analysis was in each case carried out by researchers.

3.2 Case descriptions

In this study novel applications were designed for preventative healthcare providing consumers versatile knowledge of their health and wellness status. The business case included three different case studies

presented in this paper: wellness application for employees to support exercising during work, a game for activating memory, and an application for strengthening the relationship of couples.

In the **Case A**, a mobile user-oriented and self-motivational service for employees well-being, was created. The idea was to develop a service, *Taskuvalmius*, which helps users adopt small, yet efficient, improvements in their daily routines. The digital service supports the physical well-being programs Valmius offers to companies and enables a continuous way to change the daily routines. In the Owela study background information about the users was collected related to their well-being at work, possible work-related musculoskeletal disorders, as well as their habits of using digital devices. Information about their previous experience of physical well-being programs was also gathered in addition to feedback on four different service concepts presented in this study. The concepts were presented to the participants in Owela with a picture and a short description of the service. The different service concepts (see Figure 2.) were as follows:

c1. a written wellness guide in a pdf version that can be read electronically on a computer, tablet device, or mobile phone;

c2. a workplace-specific welfare manual that includes an instructional video, ergonomics tips, break workouts, home workouts, preliminary tasks, to-do list, exercises, etc.;

c3. a quick guide that summarizes the relevant instructions with illustrations; and

c4. a wellness diary that includes a communication channel with personal trainers and a physiotherapist and integration with all sport and meal trackers.

c5.

Fig. 2. Different service concepts presented to the participants in Owela discussion in Case A.

In **Case B**, the memory game, the goal was to develop a novel mobile memory game application that enables a consumer to activate her or his brain in order to prevent memory disorder. The *Muistimestari* memory game is an interactive application that is divided into three themes: short-term memory, remote memory, and other memory games for everyday life. The application consists of various exercises ranging from numeric to visual tasks and music. The game aims to provide additional value for the readers of the Valitut Palat magazine. In Case B Owela was utilized to determine users' attitudes and expectations towards the application prototype, consumers' interest in the game in general, and more specifically in the layout and usability of the user interface. The participants followed a link from the Owela page to the prototype. The game and the idea of the game were first described briefly, after which the users were allowed to test the game freely and navigate the application without any specific instructions. Then they were asked to test different game types inside the application and to give feedback.

The layout and user interface of the memory game (in Finnish) are presented in Figure 3. The first screen is the first page of the memory game. On the second screen a simple layout of the navigation panel is presented. An example about number sequences game type where the user is asked to try to remember different number sequences, is presented on the third screen. On the fourth screen there is a layout of one of the games presented, in this case a lyrics game, where the user is asked to fill in missing words from popular songs. Together with the game, some purchase options were also presented e.g. a possibility to buy a CD where the song from the lyrics game is included.

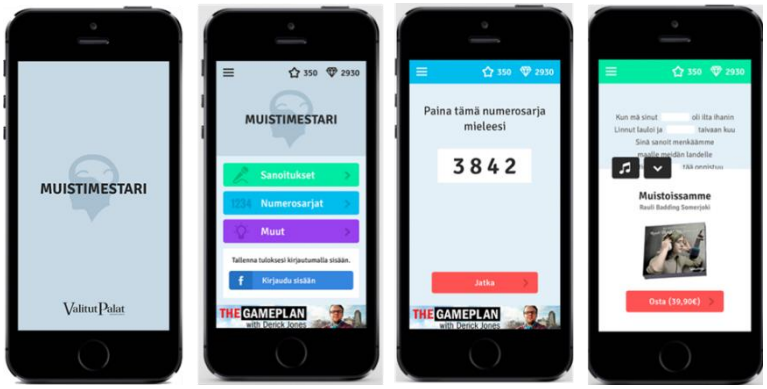

Fig. 3. The layout and user interface of Case B.

In the case of the relationship strengthening method (**Case C**), a new mobile version of the *Wedidit*® relationship method was created. Wedidit® is an online tool that provides an effective and entertaining method for improving and building a healthy and satisfying relationship for couples. The method is based on positive psychology and cognitive therapy and was one of the first digital methods to challenge the traditional therapy and couching methods. In this studythe test couples participated in a 4-week program. The method begins with an analysis, a simple test in which users assess their satisfaction with various areas in their relationship. The result gives an overall picture of the current state of the relationship and sheds light on areas in which both parties could improve. After completing the analysis phase, the service starts to suggest different exercises. In this case, Owela was utilized to involve users in a discussion of their experiences with the service and to give feedback about the layout and usability of the service. Users also described the influence of the service in their relationship and their time consumption with the service. The Owela discussion was open for six weeks for comments. During that period, 19 couples started with the service. Nine couples completed the whole test period and gave feedback through the Owela platform.

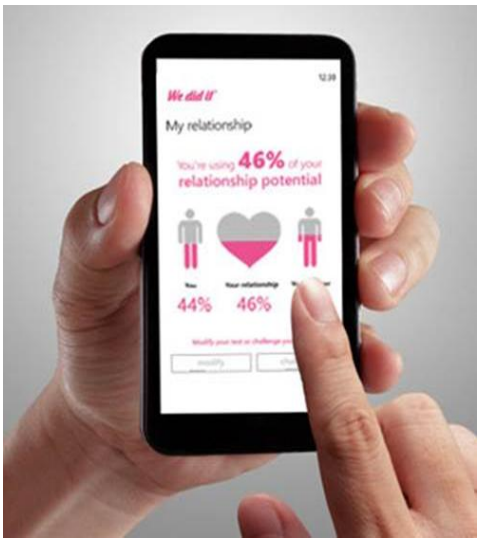

Fig. 4. The layout of relationship strengthening method in Case C.

IV. RESULTS

In all three case studies, the Owela platform was utilized to involve consumers in the innovation and development process and to give an opportunity for the developers to participate in the discussion. In Case A (wellness service for employees), consumers were involved during an early stage of development when the company had created different service concepts. Based on the discussions, the company could fail fast with

some service concepts and focus their development efforts on the ones that gained the most interest. In Case B (the memory game), the participants were involved during the development phase when a prototype of the service was available for evaluation. It made it possible to take into account users' comments and development ideas in the game development process and change some elements in the game according to the consumers' needs and expectations. In Case C (the relationship strengthening method), consumers were involved in an evaluation of an application that was almost ready to be launched. They could base their comments on actual user experience with the method.

4.1 Case A: Wellness Service for Employees

Consumers are nowadays using different digital devices both at work and during their leisure time. Most of the participants that took part in the Owela discussion worked in offices and did sedentary work with digital devices (75%). Eighty-nine percent of the respondents told that they suffer from some degree of musculoskeletal disorder. But, they have understood that *"I have to take care of my own health so that I'm still fit to work"*. Fourty-four percent of the respondents had used occupational healthcareservices to treat the symptoms, out of which 40% were satisfied with the treatment they received from occupational healthcare services. Training related to the prevention or facilitation of musculoskeletal disorders was available only in 20% of the workplaces. Ninety-one percent of respondents would be interested in receiving the type of coaching presented in the concepts. Still, some of them pointed out that *"Instructions related to health and well-being are easy to take into use, but keeping up with these practices is challenging"*. According to the participants' experience, employers are well disposed towards well-being, but these services are easily reduced in poor economic situations.

The participants were especially interested in concepts c2 and c4 (the workplace-specific welfare manual and the wellness diary). Related to the diary, some participants pointed out that*"The advantage of the wellness diary is that I have to be active by myself and not just read the instructions"*. According to the participants, the most important factors in digital wellness services are easy to download, easy and fast to use, and useful. To ensure long-term use of the service, the content has to vary, and users expect to get encouragement and feedback through the service. The service has to be workplace-specific so the users can realize the advantages of the guide. Only 12% of the participants were not interested in any of the concepts. Some of them commented that*"I don't like to use digital applications during my leisure time due to the fact that I'm sitting beside my computer all day at work"*. Thirty-nine percent of the respondents would like to use the service on a mobile phone, 28% on a computer, and 22% on a tablet device.

Interactivity with other users in this context did not play a major role. Most of the respondents (70%) were not willing to share their personal results with their colleagues. Sharing was seen as an element to increase stress and competition, and hence more as a negative than positive feature. However, there were some comments in favour of interactivity with other users presented by the participants; some participants found it nice to work together with colleagues for well-being, and to receive encouragement inside the team.Team work was seen as making it easier to challenge yourself with new habits, and as a positive feature to be able to share your experiences with others.

4.2 Case B: Memory Game

In the Owela discussion related to Case B, memory game application, most of the participants (83%) mentioned that they had played computer games or other digital games by computer (45%), tablet device (29%), and smart phone (26%). The prototype of the service was tested on a desktop computer (52%), laptop (36%), tablet device (8%), and smart phone (4%). Generally, the participants were interested in improving their own memory, testing their short-term memory and remote memory, and getting information about memory techniques, like *"I know my memory is weak and I really want to develop myself"*.

According to the participants, the game should include more variation in the types of games and they would like to get encouraging feedback about their success. There should also be different levels in the game to challenge the user's memory. For example, *"There should be lots of content in the application and always something new and challenging. Otherwise I would remove this application from my mobile phone"*. Half of the

participants were interested in collecting points from the exercises, 29% were not interested in collecting points at all, and 21% were interested in collecting points just to track their own success.

According to the participants, playing the game would be time-consuming. Users estimated the amount of time they would be willing to spend on playing the memory game; the estimates varied from five minutes to several hours. They pointed out that *"I'm willing to use my time with the application if it is interesting and feels worthwhile"*. Some of the participants would like to play daily, some only every once in a while. Users felt the mobile application was valuable because they were interested in playing the game when they are commuting or e.g. waiting at a bus stop. They were used to the fact that mobile games can be acquired free of charge, and they would not be willing to pay for the game or only a small amount. Participants commented that *"I could pay for feedback or extra game content"*.

The participants also stated that they would like to compare their results to other users results. For example, *"I'm quite competitive so it would be an extra bonus if I could compare myself to others"* but at the same time some of the participants felt that *"I have no need to share these kinds of results with others, and I'm not interested other's results"*. More than half of the respondents (63%) would like to receive feedback about their success in verbal form (43%) or an anonymous list (38%) of results, e.g. *"It would be nice to get response on e.g. that my memory is equal to that of average middle-aged woman"*. Most of the participants were not interested in sharing their results (64%) through social media.

4.3 Case C: Relationship Method

On the basis of the Owela discussion, users generally liked the relationship strengthening method. At first, the idea was felt to be funny, but using the method many participants stated that they had been really surprised: The application had exceeded their expectations. One of the participants told that *"In the advance, the idea of a relationship game felt pretty stupid, so, we didn't expect much. But this application was actually nice and useful. Particularly good was the fact that the application forces you to pay attention to the small things in everyday life and makes you understand that they specifically have an impact on happiness"*.

According to the couples, the analyser part of the application was easy, fast, and effortless, and the analysis covered all relationship areas well. Most felt that *"After completing the analysis part I think we had discussed various areas of our relationship, more than we had in a long time"*. Couples observed quite easily the areas of the relationship in which both hoped to improve. The couples also stated that it was gratifying to observe how small things and actions already affected everyday life in a good way. The analysis made communication easier. Still, some stated that *"The application could also include guides for discussion"*. They also asked for clearer instructions on how the results from the analysis affect the process in the program, the weekly tasks.

All couples stated that happiness in their relationship increased after they used the method. The effect of the application was most valuable in communication and sex and intimacy domains but had also a positive influence in all the other domains: housework, actions, and quality time. Couples who had been the most dissatisfied with their relationship in the beginning felt that they had been able to improve their relationship by using the method. Still, the method was clearly also useful for couples who had better a starting point in the beginning of the program. During the program, the increase in happiness was studied in repeated tests, in which the couples rated the emotions in different sub-regions in their everyday lives (satisfaction percentage). The satisfaction rate rose for all the couples during the program.

Participants liked the simple and modern layout of the application but criticized the main picture in which the couple is arguing; *"I would prefer pictures of happy couples, something to be sought for by using the application"*. Links inside the application should be more visible, and navigation and scrolling easier. Users liked the feature that the application sent reminders about the tasks. Many tasks were available in the program; users usually optimized the task by choosing the ones that were realistic to fulfil during the week. In general, the participants did not pay a lot of attention to the graphics presented in the application.

Users spent several minutes online while using the application. They felt that it was a suitable amount of time and *"The most important parts were done offline with the spouse"*. Opinions about the optimal length of the program varied among the participants. Some got bored during the four weeks; they felt that there should be more variation in tasks and in the content of the application. Some users mentioned that they would like to use the application continuously. Still, all asked for surprises, some unexpected content for the application.

V. DISCUSSION

Digitalization is everywhere; it is the technological backbone of our society. Digitalization and mobile phones as a platform in health and well-beingdomain offers opportunities and new potential services for consumers, healthcareproviders, and industry. The use of technology for improving wellness and motivating users in their wellness activities has expanded remarkably within the last few years. Users are able and willing to utilize digital devices and digital services in their everyday lives. They also want to contribute to better products and services. This is an advantage for companies that have understood the importance of involving the end users of the product or service in the innovation and development processes. Consumer behaviour has changed due to digitalization, and this change must be taken into consideration when developing services for customers. Traditional, physical wellness services may benefit from digitalization significantly as service providers have the opportunity to offer added value to their customers, reach a large number of users, follow users' progress, and continuously interact with their customers.

In this study, a group of consumers tested and evaluated different digital wellness services. The services were in the different development phase, so, they got a bit different kind of feedback. For example, in Case A, users evaluated different concepts and the feedback from them was more like what kinds of features should the novel service include and how the participants would like to use the service. In Case B, participants understood the prototype of the service is quite an early phase and the ideated how to develop the service more. In Case C, the service was almost ready to be launched and users commented more in detail e.g. the layout of the service, pictures and colours and also the navigation properties.

Generally, consumers were positive about digital wellness services; they would like to use these types of digital services to improve their own health and well-being. It was also preferred to use the wellness services by a mobile phone. People have used to use their smart phones more and more in different situations and they are carrying the devices almost always with them. When developing digital services, there are several issues the service provider has to pay attention to. Generally, the rules in developing digital services are the same, but in the case of wellness services there are also some issues that are more sensitive. Table 2. summarizes the important issues for development of digital wellness services, pointed out in this study, answering research question Q1. Most of these issues have to take into consideration also in digital service development in general.

Table 2. Important issues in digital wellness service development.

	Mobile Wellness Service
Advantage, Usefulness	• Users have to realise the advantages they are gaining from the service. • Integration of the service in daily life is important to enable the behaviour change. • The service also need to guide how to do the change, "Be my advisor".
Easiness	• The user interface of the service has to be clear and easy. Users do not want to read any instructions. • The implementation of the service has to be fast and easy.
Variation	• Users get bored if the content of the service is too similar week after week. • There also has to be different levels in the service, it has to challenge enough.
Personalization	• Users prefer services that can be personalized for their own purpose.
Feedback	• Users want to receive feedback on their personal success. • Users are willing to compare themselves to others, but in the case of wellness service, it has to be done in a sensitive way (see, Privacy). • Feedback has to encourage them to gain their goals.
Interactivity	• Users like to have an active role in using the wellness service. It is not enough e.g. to passively read the guides. They have to do it by themselves and get an own experience. • Reminders from the service may encourage to use the service also in long term.
Privacy	• Health and well-being are private issues for users, there has to be a possibility to use the service alone. • Users are not necessarily willing to share their results with others. • Users have to have a control in what kind of use feels comfortable.
Real-time	• Users want to have access to the service anytime and anywhere, they have to have a control when the time is right for using the service.

First, the users of the mobile wellness service have to realize the advantage of using the application. As van der Heijden [30] and Mattila et al. [10] presented in their studies, integration of the service in consumers' daily lives and the usefulness of the service in certain environments are important. This is also the case in Case A, the work environment, where the content of the service has to fit the environment where the service is utilized. This was also the challenge in user involvement in the development process in this study, as generic content suitable for any user was utilized. Advantage of the memory game was clear to the users, and they expressed a wish to know in more detail how good their memory capabilities were. Also the advantage of the relationship strengthening method was clear, and the couples using the method could get an evaluation of the starting point, i.e. the state of their relationship when beginning to use the method.

Ease of use positively affected consumers' attitude regarding the service [12] and is a key requirement for personal health technologies [10], as was also noted in the present studies. Easy and modern layout was preferred. In the case of wellness services where sensor technology is combined with the mobile service it is important that also the sensors and wearable technology should be designed to be easy and unobtrusive to carry along [5].

Variation in the service is also necessary, users get bored if the content of the service does not change or surprise them. This is closely related to "Keep me engaged" [11]. Users expect that when they invest in increasing their health and well-being, they can reach different levels in the service. The service has to challenge them enough; it cannot be too simple. The service can get harder when the user succeeds on her or his tasks: "Grow with me," as Ahtinen et al. (ibid) formulated this issue. Game-like elements may be utilized to make the application feel more personal, for example reaching a more difficult level when easier tasks have all been completed. Ahtinen also pointed out the individual needs of the users that rose also in this study. In the case of well-being, the challenges and goals are very personal.

Motivating and encouraging users to reach their own goals in the form of feedback has also risen in many previous studies: clear feedback [10] with advice combined with recognition of users' success and effort [11, 12]. In this study, feedback was mentioned as an important issue for ensuring the long-term use of the service. Also for this, game-like elements may be useful and motivating, and at the same time as they encourage the users to keep on trying, they may also serve as a positive surprise for the users. According to previous studies [31, 32], optional rewards affect the level of contribution and time spent with the service. However, this depends on the user. In this study, the memory game users collected points from successfully completed exercises; half of the participants were interested in collecting points, whereas 29% were not at all interested in collecting points. In the case of the relationship method, some couples stated that they competed with each other to complete more tasks and do more things than the spouse had hoped for. However, feedback in the form where the users compared their own progress with that of others was also seen as negative and stressful, e.g. by some users of the employee well-being service. In our study, the importance of active role of the user was also mentioned. Users felt that they want to be active and experience things, not just passively read information related to health and well-being.

Generally, services including gamification often include strong social features [33] and affect attitude formation positively [12]and also, increase motivation [9]. Even if consumers are surrounded by thousands of digital applications available for their mobile phones and even if they use social media to share their pictures and feelings, it is important to understand that when dealing with such private issues as personal health and well-being, users can be more distant. According to the present study, personal health and well-being issues are considered as private, and users do not necessarily want to share them with everyone, maybe not even with their closest friends. This really has to take into consideration in the case of wellness services, the service provider in this area must act very sensitively. Based on our study, it is important that the users have control on whether they wish to keep data of the progress to themselves or whether they wish to share it. Some users the possibility on team work in the case of employee well-being (Case A) attractive, and some users of the memory game (Case B) were interested in getting more information of their results compared to others playing the same game. Even if the user could stay anonymous in the latter case, it would still require sharing of personal data at least with the service provider. Naturally, one part of privacy topic is also the data gathered by service providers and the utilization of the personal data by second and third parties [4].

The selection of digital services is wide and they compete with the time that users may spend with them. Even if the digital wellness services developed in this project are unique, the challenge is to engage users to spend time with the application in the long term. If the user interface is clumsy or the service does not create a solution for the users' needs and fulfil their expectations, they quickly stop using the application. This was noticed with the relationship strengthening application, as 9 out of 19 couples finished the 4-week method. The ten couples that quit using the application possibly didn't have a clear need for improving the state of their relationship or they did not see the usefulness of the service.

The amount of time spent on the service depends on the type of the service. In this study, the memory game application aimed at getting the users to spend plenty of time with the application. The application was built to be entertaining at the same time as being useful. Users wanted to use this application everywhere, and were willing to spend time with it. In the case of the wellness service for employees and the relationship strengthening method, the idea was to get instructions and tasks digitally, but the work itself was in the physical world, and users wanted to avoid spending time online. Hence, digital services can be built to a link the digital and physical worlds and, in the ideal case, be a seamless continuum of the service package.

The companies that participated in this study had previous experience in involving users mainly through interviewing their customers or sending them questionnaires. In this study, the Owela platform was utilized for collaborative design of the services. Companies got more interactive relationship with the participants and more valuable information about users' needs and expectations. According to the company representatives, they received valuable feedback from their potential customers through Owela discussions and the results were utilized in further development of the mobile services and marketing of them. Company representatives implemented the feedback from Owela from the first day the platform was open to users and they were able to start planning the next steps right away. The companies performed development work continuously in addition to the co-development work.

Valitut Palat (Case B) and Olento Life (Case C) have modified their application, the user interface, and the layout based on ideas from the users. Valmius Hyvinvointiin Group (Case A) received clear feedback on which digital service concepts to develop further and offer to their customers. They also got confirmation to their service idea; people would like to use this kind of wellness service at work.In all cases, the feedback from consumers confirmed the expectations the companies had had for their services. In their opinion, it is possible that they would have ended up with similar solutions even without consumer involvement, but they estimated that this could have lengthened the development process considerably, and in the worst case, some important issues might have risen just after the service was released. The feedback the companies received from the study was seen as extremely important for their development work.

Kujala and Mao et al. found that user involvement leads to more accurate user requirements, features that meet users' needs, increased acceptance of the system, and enhanced ease of use [14, 15]. As the services tested in this study were in different development phases, the benefits from user involvement could be compared. Involving the users in concept phase resulted in the company using the research data for decision making and in drawing strategic conclusions on how to move forward with service development. A qualitative user discussion functioned well for fail fast purposes, as the participants in Owela discussion were able to justify their opinions and the developers could ask for more reasoning when needed. In the prototype phase and with a service nearly ready to be launched the benefits from user discussion for the companies were very similar. Ideas received from the users were more specific and more incremental than in the concept phase, although some ideas could have been used in a more strategic way (e.g. larger utilization of gamification). In these cases, it was also very important for the companies to hear critical comments from the users before entering the market. These findings give answer to research question Q2.

The research shows that this type of collaborative design process provides concrete benefits for service providers: they receive valuable feedback about customers' opinions towards their services to be used in developing and marketing the services. The companies modified the applications, the user interface, and the layout of the service based on ideas generated by the user study. In this study, companies also pointed out the importance of continuing to interact with their customers after the wellness services have been released. As its best, participatory research is an ongoing dialogue with customers, a natural part of the company's operations.

In addition, according to Hoyer et al. [18], the greater the role of consumers in the innovation process, the higher the product quality and the likelihood of its success.

Challenges in well-being, both at work and in relationships, as well as in memory disorders are universal, and hence, digital wellness services can potentially be developed for international markets to offer cheaper, easier, and more private options and solutions for the users. Digital services can create a link to physical services and in the ideal case be a seamless part of the service package. The biggest challenges are to reach the right users for the service who are also willing to pay for it. Digital services are sensitive to being copied for use by the competitors.

VI. CONCLUSIONS

Digitalization has affected production, services, and business processes and caused clear differences in ways that companies interact with their customers. Digital technology is recognized to be one of the successful themes for economic growth. The use of technology for improving wellness and motivating users in their wellness activities has expanded remarkably within the last few years; digitalization offers opportunities and new potential services for consumers, healthcare providers, and industry to enable more cost-effective health promotion and disease prevention. Digital services are developed to enhance or support traditional physical services or for self-care purposes. At the same time, users are willing to spend money and time to take care of themselves.

In this study, three casestudieswere introduced. In all the three cases, consumers were involved in the development processes of novel digital wellness services, and the Owela platform was utilized in the co-innovation and co-development processes. In early development phases companies may test different service concepts to fail fast with ideas that don't attract the desired focus group (Case A). In later development phases they may receive detailed comments for refining the service and have a possibility for reacting with critical viewpoints prior to launching the service (Cases B and C).

The case studies showed that companies significantly benefited from involving users; they got valuable feedback about the users' opinions of the services to be used in developing and marketing the service. In all cases, for example, the feedback from consumers confirmed the companies' expectations for their service. In addition, using collaborative design, companies were able to speed up their development processes, learn which solutions were favoured by the consumers and why, failed early, and directed their service development according to consumers' needs and expectations.

Digitalization has changed the world and consumer behaviour. Users use digital devices and the selection of digital entertainment services is wide; more than 100,000 health- and medical-related applications are available for mobile digital devices. Deeper integration of sensors and interactive tools would allow us to foresee drastic changes in new services.

Even if the digital wellness services developed in this project are unique, the challenge is to habituate users to utilize the application for the long term. If there are mistakes in the user interface or the service does not create a solution for users' needs, or they do not see the advantages of the service, they easily stop using it. Service providers have to think carefully how to entice users, how to encourage them to reach their goals and to develop themselves. This study concluded that the following principles were relevant in the design of mobile wellness applications: 1) advantage for the user, 2) ease of use, 3) variation in context, 4) personalization, 5) feedback, 6) interactivity, 7) privacy, and 8) real-time availability. These findings correlate well with the results from previous studies. Compared to digital service development in general, interactivity, privacy and real-time issues seem to be the facts to be specially paid attention to when developing services for health and well-being.

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