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DEVELOPING SHORT-TERM EXCHANGE FOR MASTER'S DEGREE STUDENTS IN DIGITAL SERVICE DESIGN

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Abstract

In order to respond to the challenges posed by networked and complex digital service constellations, new competences and methods that can be used to facilitate digital service design are required. The service design and agile approaches have been rapidly adapted among designers. The service design methods and tools have proven to be very effective in bringing users experience into the focus of the design process, while agile methods seem to complement the service design approach by providing tools and procedures for iterative designing and testing of digital services.

The existing international student exchange financial instruments require a relatively long exchange time. On the other hand, applicants for the master's degree programs in digital service design (at UAS) must have a suitable bachelor's or master's degree completed, and at least three years of work experience after graduation. This implies that digital service design master's degree students are mainly full-time employees, and therefore the commitment to the financial conditions of the existing international student exchange instruments may be challenging for them. Consequently, there is a lack of international cooperation programs for higher education that support flexible short-term exchanges and mobility and that are widely targeted to several countries.

Together these conditions have resulted in the need for (1) developing the content and practices in digital service design studies, and (2) novel short-term international student exchange for master's degree students in the field of digital service design. The purpose of this paper is to find out how the service design approach could benefit from agile development methods in digital service design studies. The aim of the paper is to develop a new concept for short-term international student exchange for master's degree students in digital service design. The short-term exchange pilot is a part of a project called Finnish Design Academy, which focuses on developing a new collaboration model that aims to strengthen the role of higher education in design within the Finnish innovation ecosystem as well as to promote the internationalization of design education.

This paper describes an international student exchange pilot that was conducted jointly by Laurea University of Applied Sciences (Laurea) and Universitat Autònoma de Barcelona (UAB) during spring 2019. Laurea provided the pilot with the service design approach and UAB the engineering view for agile software prototyping. The objectives of the pilot were: (1) to provide students with competence to use diverse development methods and tools flexible at all stages of the service design process in a digital context; and (2) to outline a new concept for short-term international student exchange for master's degree students in digital service design. The pilot extended understanding of new digital service design competences based on the service design approach and agile development methods. Based on that understanding, a new concept for short-term international students exchange for higher education students in digital service design was created. The results also indicate that the competences from Laurea and UAB are complementary. The main contribution of this paper is the new concept for short-term international student exchange aimed at providing them with the ability to design digital services with agile methods.

Keywords: service design, agile methods, digital service, higher education.

1 INTRODUCTION

Laurea University of Applied Sciences (Laurea) is a pioneering university in service design education on master's level and offers two master's level programs in service design (Service Design and Service Innovation & Design) and one in digital service design (Innovative Digital Services of the Future). The programs approach service design from the theoretical perspective of service marketing

and management. The scope of the master's degree at Laurea is 90 credits, which consists of a core competence module (30 ects), complementary module (30 ects), and master's thesis (30 ects). The complementary modules support individual study paths and make it possible to deepen or extend students' knowledge and competences. Applicants for the master's degree programs in digital service design must have a suitable bachelor's or master's degree completed at a university or a university of applied sciences and at least three years of work experience acquired after graduation. This implies that master's degree students are mainly full-time employees, and therefore the commitment to the financial conditions of the existing international student exchange instruments may be challenging for them. Consequently, there is a lack of international cooperation programs for higher education that support flexible short-term exchanges and mobility and that are widely targeted to several countries. The existing financial instruments of international student exchange (ERASMUS, Nordic+? etc.) are not sufficient to meet master's degree students' needs for international exchange, because they require a relatively long exchange time (minimum 3 months).

The Finnish Design Academy (FDA) project (2018 - 2020) funded by the Finnish Ministry of Education and Culture focuses on developing a new kind of collaboration model that aims to strengthen the role of university level design education within the Finnish innovation ecosystem. The goal is to develop students' competence to better take into account the needs and demands of working life nowadays and in the future. Another aim of the project is to internationalize design studies. Laurea as a part of the FDA project, focuses on service design in master's level education. Laurea aims at developing and internationalize service design education by a new international student exchange model with its new partner, Universitat Autònoma de Barcelona (UAB).

The UAB is a multidisciplinary university which owns a Campus of International Excellence awarded by the Spanish Government. UAB is part of the European University consortium granted by the European Commission, which for UAB is build up around the core of the European Consortium of Innovative Universities. Computer Sciences is one the UAB areas of growing impact in society, particularly due to the collaboration between the University and Research Centers, such as the Computer Vision Center. Understanding the social impact of AI and other key technologies, and also understanding the positive territorial development associated to them is part of the mission of the UAB. In this context, the Final Year Project that all the students have to do in a compulsory way in to obtain their degree has appeared as an enormous opportunity to investigate multidisciplinary collaboration, and to extend the impact of their contributions (particularly in the field of Computer Sciences) to Humanities and Social fields.

This paper describes an international student exchange pilot that was conducted jointly by Laurea and UAB during spring 2019. Laurea provided the pilot with service design approach and UAB engineering view for agile software prototyping. For this purpose, a new complementary study unit called Design Management (10 cr) was created for the master's students. The objectives of the pilot were: (1) to provide students with competence to use diverse development methods and tools flexible at all stages of the service design process in digital context; and (2) to line out a new concept for short-term international students exchange for master's degree students in digital service design. The purpose of this paper is to find out how the service design approach could benefit from agile development methods. The aim of the paper is to develop a new concept for short-term international student exchange for master's degree students in digital service design.

2 SERVICE DESIGN AND AGILE METHODOLOGY

The starting point for the short-term international student exchange was to offer students from both higher education institutions complementary skills. This chapter introduces the theoretical framework on which new knowledge was built: Service design and future foresight (2.1), Agile methodologies (2.2) and Design management (2.3). Laurea provided the pilot with the service design approach and UAB the engineering view for agile software prototyping.

2.1 Service design and future foresight

Service design represents a human-centered, creative, iterative approach to the creation of new services [4], that incorporates multiple contributions from service marketing, operations, and information technology, all integrated through design-based methods and tools [16, 17]. Service design aims at designing services that are useful, usable, and desirable from the user perspective, and efficient, effective and different from the provider perspective [13]. This requires a holistic view of all the related actors, interactions, supporting materials, and infrastructures. Stickdorn et al. (2018)

define eight service design principles: (1) human-centered: understanding the user by doing qualitative research; (2) collaborative: involving all relevant stakeholders in the design process; (3) iterative; (4) sequencing: partitioning a complex service into separate processes; (5) evidencing: visualizing service experiences; (6) real: service design takes place in authentic service environment; (7) holistic: considering touchpoints in a network of interactions and users; and (8) multidisciplinary [18].

The literature describes several service design process models, consisting of three to six phases (e.g. Moritz 2005, the British design council 2007, Stickdorn et al. 2018), but fundamentally all models share the same logic and mind-set. Because of its simplicity the most popular and commonly used service design model is probably the double diamond by the British Design Council. It consists of four phases: discover, define, develop, and deliver. Diverge and converge steps alternate in different phases of the service design process [6]. Ojasalo et al. (2015) developed the double diamond further by combining future foresight methods with service design thinking and methods (Table 1). Combining future foresight and service design has many synergy advantages as both approaches focus on understanding the customer, understanding the context and seizing the opportunities. That form the basis for the framework as sensing and seizing. [15].

Table 1. *The service innovation process grounded on foresight and service design [15].*

1. phase	Map and Understand	Mapping future changes in business environments and understanding and anticipating customers' needs and desires in their contexts are essential in building sensing capability for service innovation purposes. The methods of foresight help to gain a holistic and systemic view based on insights from a range of different viewpoints. Monitoring and scanning the environment are essential in sensing changes in the society, economy and technologies, and anticipating their future developments.
2. phase	Forecast and Ideate	Findings from the mapping and understanding phase are taken forward to inspire ideation and to forecast alternative futures. Open-minded collaboration and co-designing with different stakeholders through forming heterogeneous teams is the key to providing divergent thinking for innovation. Foresight fosters alternative thinking in service ideation and allows understanding of not only probable but also possible futures.
3. phase	Model and Evaluate	Modeling new service solutions moves the service innovation process from sensing to seizing new opportunities. The intangible nature of service solutions and the uncertainty of the future both require narrative and visual means to propose, communicate and test potential new service solutions. Therefore, service design and foresight create highly visual and anticipatory stories by means of scenarios, prototypes and preliminary concepts, for example. This phase includes zooming in and out, i.e., focusing on details and seeing the holistic picture.
4. phase	Conceptualize and Influence	The fourth phase of the service innovation process conceptualizes the new service finally influencing the future. This phase aims at transformation, and accordingly, the future is narrowed toward the preferred. This is also the phase where concurrent business analysis is integrated into creative thinking. Illustrative foresight and service design methods and tools that can be used in conceptualizing service innovation and influencing the future.

The other common factors are future-orientation, creative problem solving and participatory user focus. Future oriented service design framework can be described with four phases starting with realizing and sensing the phenomenon or opportunity and then moving towards seizing the opportunity with concrete actions. Researchers propose different working methods for different phases. The four phases of the framework are: (1) Map & understand; (2) Forecast & ideate; (3) Model & evaluate; and (4) Conceptualize & influence (Table 1). The process is not linear but instead holistic and iterative and it's natural to use increasing customer and user understanding to improve the results by returning to previous phases during the process. [15].

2.2 Agile methodologies

The use of agile methods has significantly expanded as many private and public organizations have incorporated the agile approach as part of their innovation process [9]. However, there is no generally accepted definition for agile methods. Instead, there are numerous different terms such as 'agile development', 'lean innovation' 'lean development,' 'lean enterprise,' 'lean start-up,' and 'lean business development'. Most of the descriptions agree that agile methods are about working within a small team in the same location in close contact with customers. [11]. About 20% of the service or product

features generate 80% of their value [19]. Thus, the aim of agile methods is to identify the features that have the highest value for the customer and to prioritize them.

Agile methods are most commonly used in software development [9]. The Manifesto for Agile Software Development, released in 2001, summarized the four principles of agile development as follows: (1) Individuals and Interactions over processes and tools; (2) Working software over comprehensive documentation, (3) Customer collaboration over contract negotiation; and (4) Responding to change over following a plan. Blank (2013) presents lean start-up as an iterative process that emphasizes rapid experiments with minimum viable product (MVP) in order to get feedback from potential users. First, the aim is to understand users' needs, and more widely, market opportunities, then ideate and create solutions, and finally test the created solution with real users. [3]. The service will be developed more completely through multiple development cycles that last usually from two to four weeks. Knapp et al. (2016) have presented a design sprint that take five days. Day 1: Make a map & choose a target, Day 2: Sketch competing solutions, Day 3: Decide on the best solution, Day 4: Build a realistic prototype, and Day 5: Test with users. The sprint gives design teams a shortcut to learning without the actual implementation and launch of the service or product [12]. Service design that concentrate on digital services would clearly benefit from the agile approach.

2.3 Design management

The definition of design management is not unambiguous [1]. Depending on the source, it can mean different things. From a narrow perspective, it can be considered a tool to manage a design project and manage new service or product development through design principles. According to Cooper et al. (2017), it is no longer enough to develop good products or services, but the design should aspire to a passion for improving the quality of life of people who use the products and services. Design should aspire to demonstrate a passion for betterment. Design management is the means to foster that passion by linking it to the fulfilment of corporate goals and profitability. New product and service innovation requires comprehensive user research and customer understanding that is grounded by service design principles [18]. In principle any aspect of business, not only new service or innovation, can be evaluated and developed through service design principles [15]. That means managing design can also have different meanings depending on the context. Design management brings together best practices in developing designing goals, strategies, plans, and management structures to achieve the improvement [7]. Embedding design into all company activities, provides innovation not only in products, services, and processes, but it brings benefits to all stakeholders and improves company performance in the market [2].

The basic function of design management is to use it as a competence to differentiate the products [5]. The fundamental premise of service design is to focus on achieving goals. This is called goal-directed design that emphasizes user goals but also incorporates the goals of customers (people who purchase but do not use a system) and the goals of the business creating the service [10]. The intent is to ensure transparency and great results in a timely manner. This means that service design and design management use the same tools and methods to get user understanding; they both aim at the same goals, but design is the means to create the structure around it. Cooper et al. (2017) define design management as checklists of best practices [7]. Goodwin (2009) describes how to manage design projects. Her instructions can be used as a comprehensive list of examples for best practices. Her design project can be described with 74 steps. To develop customer centric services, the structure and best practices are one side of the coin, but equally important is the other side: the design team and the collaboration. She defines an ideal set up for design team, collaborators, and other stakeholders (Table 2).

Table 2. Teams and collaborations [10].

<i>Design team</i>	<i>Close collaboration</i>	<i>Other stakeholders</i>
Interaction designer – generator	Project owner	Executives
Interaction designer – synthesizer	Design engineers	Marketing
Visual designer	Subject matter experts	Sales
Industrial designer	Business analysts	Other engineers
Team lead	Usability testers	Technical writers
		QA

She also recognizes that not all the teams are ideal, but often the teams need to cope with the resources they have and find ways to get the working environment to be as good as possible. The sooner the right skills and working relationships are in place, the more effective the design will be. There is no explicit formula for a design project as it depends on different variables, such as extent of the project and experience of the team. [10].

Project plan development is usually an iterative process based on what can and cannot be accomplished within the timeframe with any assumptions, support needs, feedback turnaround times or other factors. In an ideal world, the design team and engineer collaborate throughout the project. It is important to understand the stakeholders' expectations, timeline, and investment required to achieve it. Trade-off decisions affect thoroughness, speed, and budget, and development of realistic expectations. Goodwin (2009) focuses on design management as a means to manage innovation in product development in the digital era. [10]. However, design management can also be a strategic asset. Ahopelto (2002) studies design management through three factors: product, environment, and communication. As a core competence and a function within the company structure, design management can be used to build company image, modify processes, and manage innovation beyond the design excellence aspect in portfolio differentiation. It can be used for continuous improvement to transform management processes and to define a competitive advantage in the company value chain system [5]. In this case study, design management was used as a tool to manage development of a software application, but strategic aspects are discussed in the conclusions section.

3 SHORT-TERM EXCHANGE FOR MASTER'S DEGREE STUDENTS IN DIGITAL SERVICE DESIGN

This study is a descriptive single case study. The case study research was selected because the study investigates a contemporary phenomenon within its life context, and uses multiple sources of evidence. The case study consists of piloting a short-term international student exchange that was conducted jointly by Laurea and UAB during spring 2019. Laurea provided the pilot with the service design approach and UAB the engineering view for agile software prototyping. The objectives of the pilot were: (1) to provide the students with competence to use diverse development methods and tools flexible at all stages of the service design process in digital context; and (2) to outline a new concept for short-term international student exchange for the master's degree students in digital service design. The research data were collected during the pilot and it consists of the pilot plan, observation and documentation, as well as student's self-assessment and feedback. The data were analyzed by content analysis.

A new study unit called Design Management (10 cr) was created by Laurea for the exchange of the master's degree students. The aim of the study unit was to provide the students with the following competences: (1) managing design strategy, process and implementation; (2) understanding how to develop a digital service concept into a functional digital service; and (3) creating a mutual understanding (e.g. of requirement specification) and co-design with technical developers and other stakeholders during a digital service development. The master's students were assigned to further develop a digital service concept that was created as part of the service design process and method study unit (10 cr) at Laurea for a Finnish wellness technology company. Their aim was to build the functional service concept of a mobile service into a functional mobile software application in collaboration with UAB students. The collaboration provided master's students with a better understanding of building a digital service; how to transform a concept or a functional prototype into a functional mobile software application, and how to communicate with technical developers during the digital service development (e.g. how to create a mutual understanding of requirement specifications).

3.1 Progress of the pilot project

The master's degree students in digital service design were given the design management assignment to communicate the digital service concept to the UAB technical team and to collaborate with them on implementing the design into a functioning mobile application by applying design management practices. The service design concept was created for users who are interested in their health and wellbeing and have sports in an important role in their lives. As part of the user research, future foresight methods were used to predict the future scenarios for people interested in their wellbeing people in 2030. In addition, comprehensive qualitative user research was done to authentic wellness technology users. Different methods such as interviews, design probes, ethnography, experience sampling, and competitor analysis were made to collect data about the current stage.

Research data was analyzed and grouped and categorized to different themes. The purpose was to get deep understanding of user pain points, needs, and wishes for future service innovation and concept creation. Categorized themes were used to create user personas.

The new service concept's main purpose was to serve busy people who have health and wellbeing high on their priority list, but constraints in time management that cause difficulties in balancing their work, free time, social life and physical exercises. The service concept helps to balance their lives by recognizing stressful situations and giving guidance on how to relieve stress. Another important part was sleep quality. Sleep quality plays an important role in both physical and mental health along with cognitive skills. Thus, sleep quality monitoring and guidance for better sleep was also included into the service concept. The first steps of the concept development are presented below (Fig. 1).

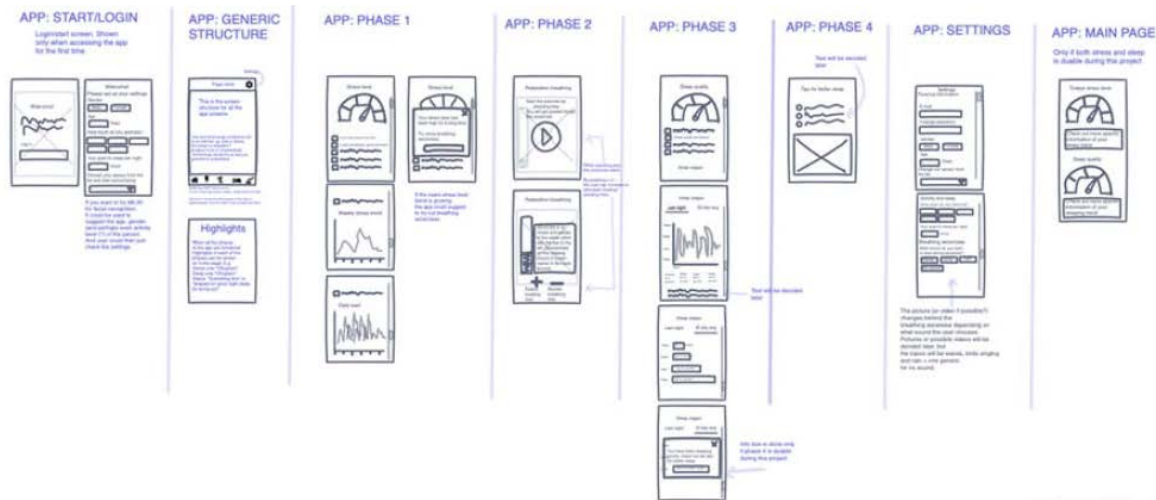


Figure 1. Wireframes of the application

The master's degree students had no prior studies on design management before the start of the pilot. They also made a huge study on physiological parameters impacting stress levels and sleep quality and methods of creating initial models of stress levels and sleep stages without big data analytics and machine learning algorithms. The results were used to create requirements specifications for the software development. Documenting the design was done as the design progressed, helping to ensure design completeness. It also ensured that everyone on the pilot team had a shared understanding. A detailed design includes not only a solid understanding of design principles and the design itself with all details but also excellent time management, collaboration, and communication skills. [10].

The master's degree students took this into account in project planning and outlined and scheduled the main tasks. They focused on big milestones first, complementing the plan with smaller things and eventually with checking points. They followed this same practice in Trello. They also created a project plan after the initial meeting with UAB students. The design team followed Goodwin's guidelines for ensuring the correctness and thoroughness of the implemented design. Additionally, they created software requirements specifications that were communicated during the meeting and shared as PowerPoint documents.

UAB and Laurea students agreed to apply agile methodologies to the project and work in sprints. Each sprint was scheduled to last one week. The design team also agreed to follow Nielsen's heuristic evaluation principles for the design [14]. The team agreed to meet on a weekly basis through Skype prior to intensive face-to-face meetings in Barcelona from June 10-14, 2019. Weekly meetings served as sprint follow-up meetings as well as a place to agree next sprint's scope. The meetings emphasized creating a safe working environment so that all students felt safe and achieved their study goals. The UAB team created the meeting agenda frame to be used in each meeting. In addition, teams agreed to set up a Slack1 and Trello2 working spaces for the project. Slack was set up to serve as an informal, continuous information and document sharing and collaboration platform. Trello was set up to document the project key milestones and tasks to be done as agreed during the project meetings.

3.2 The outcomes of the pilot project

The objectives of the pilot were: (1) to provide students with competence to use diverse development methods and tools flexible at all stages of the service design process in a digital context; and (2) to outline a new concept for short-term international student exchange for master's degree students in digital service design. According to the students' self-assessment the first of the pilot project's objectives was achieved: (1) Laurea students learned more about design management and how to proceed with a concept idea. (2) The UAB students got a better view of the secrets of service design. (3) All students also had the possibility to learn more about new tools that are helpful in these kinds of projects. A new concept for short-term international student exchange for master's degree students is presented in the next chapter.

The most concrete outcomes of the pilot were (1) the mobile application based on real customer needs and (2) the design management project checklist. The mobile application development was divided into different phases and the minimum viable product was the first phase of the application. Despite scheduling challenges, the UAB students completed all phases of the application development before their course work deadline. The final look and feel of the application design and the main screens are illustrated in Figure 2. To protect the intellectual property rights of the programmer, the developed application software code is not included in this nor in the UAB public report.

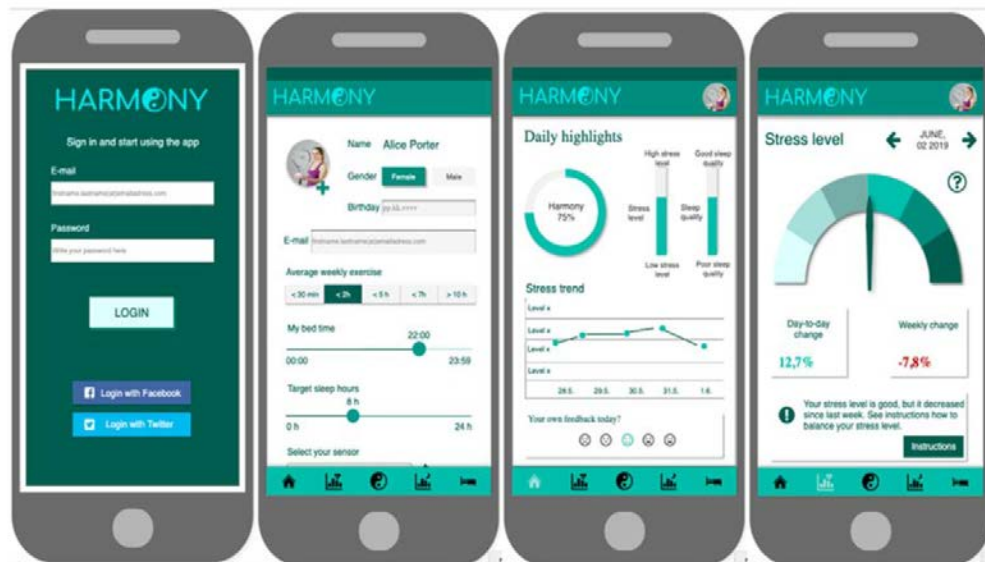


Figure 2. Screens from the project prototype.

As both Cooper & Press (1995) and Goodwin (2009) describe design management is benchmarking best practices. Laurea students used their learnings of design management to identify recommendations on how to make collaboration projects successful. For that purpose, they created a checklist for collaboration projects and identified topics that should be covered before, during and after the project. The checklist is presented in Figure 3.

DESIGN MANAGEMENT PROJECT CHECKLIST	
BEFORE THE PROJECT	1-2 MONTHS BEFORE KICK-OFF
<input type="checkbox"/> Student prerequisites: Service design, design management, UX design courses. <input type="checkbox"/> Stakeholders identified. <input type="checkbox"/> Stakeholder commitment. <input type="checkbox"/> Scope of the project mutually defined. <input type="checkbox"/> Resources defined: <ul style="list-style-type: none"> <input type="checkbox"/> Timeline <input type="checkbox"/> Budget <input type="checkbox"/> Skills <input type="checkbox"/> Joint tools <input type="checkbox"/> Students for the project selected and committed.	
KICK-OFF THE COLLABORATION	DAY 1
<input type="checkbox"/> Future trends and user research timeline defined. <input type="checkbox"/> First online meeting: introduction of the project, students and their expertise, agreement on resources, future trends and user research introduction. <input type="checkbox"/> Resources defined: <ul style="list-style-type: none"> <input type="checkbox"/> Meeting schedules /Sprints <input type="checkbox"/> Branding, Developer APIs, visual elements <input type="checkbox"/> Tools (e.g. Trello, Slack, InVision, Axure, GitHub) 	
DURING THE COLLABORATION PROJECT	1-2 MONTHS AFTER KICK-OFF
<input type="checkbox"/> Future trends & user research documented, personas created & communicated. <input type="checkbox"/> Concept draft & first wireframes created. <input type="checkbox"/> Stakeholder review: Technical & commercial feasibility analysis. <input type="checkbox"/> First face-to-face meeting: mutual review of the concept and requirement specification, evaluation of the feasibility of technical implementation, concept adjustment or changes as needed. <input type="checkbox"/> Requirements finalized and documented. (Design principles, data requirements, screen size, visual guidelines.) Iterations as needed. <input type="checkbox"/> Concept development timeline and sprints agreed. <input type="checkbox"/> SW development timeline and sprints agreed. <input type="checkbox"/> Intensive week face-to-face: mutually agreed agenda, development reviews, application usability testing and adjustments as needed.	
FINALIZING THE PROJECT	2-3 MONTHS AFTER KICK-OFF
<input type="checkbox"/> Application finalization. <input type="checkbox"/> Reporting. <input type="checkbox"/> Final stakeholder review, project reflection, improvement plan for future.	

Figure 3. Design management project checklist.

4 RESULTS

The purpose of this paper is to find out how the service design approach could benefit from agile development methods in digital service design studies. The aim of the paper was to develop a new concept for short-term international student exchange for master's degree students in digital service design. The pilot project extended understanding of new digital service design competences based on the service design approach and agile development methods. Drawing from the literature and experiences from the pilot, this paper contributes by providing a new concept for short-term international student exchange for higher education students. Thus, the main contribution of this paper is the new concept for short-term international student exchange for higher education students aimed at providing them students with the ability to design digital services with agile methods.

The short-term international exchange is based on the implementation of a longer-term cooperation project of which it is a part. The collaboration project lasts for 60 days and the work is virtual in the beginning. Collaboration culminates in a one or two-week international exchange, during which students finalize and test together the developed mobile application. The following timetable (Fig. 4) illustrates the progress of the whole cooperation project:

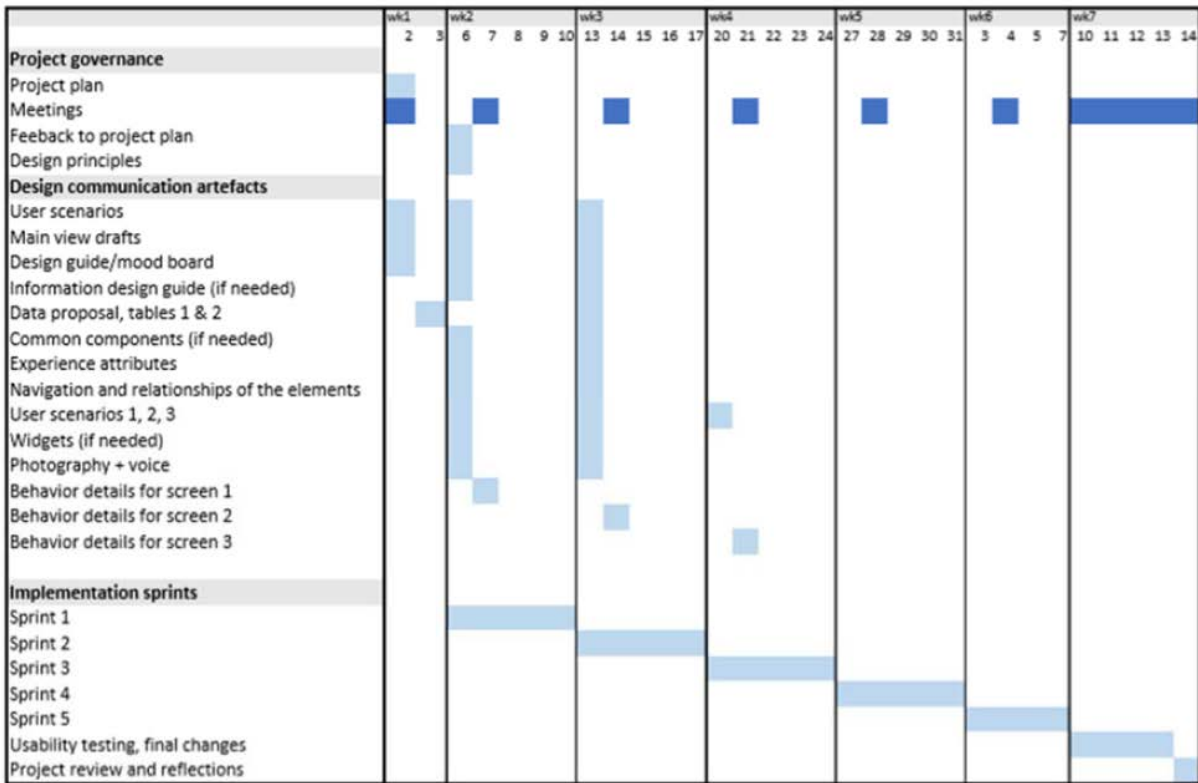


Figure 4. Steps and schedule for short-term international student exchange.

Based on Goodwin's (2009) example with 74 steps on how to manage design project, our new model is compressed to 60 steps, each for one day. The tasks and responsibilities in the model are divided between the three expertises: Interaction designer (IxDs), Visual designer (VisD), and Industrial designer (ID). Figure 5 illustrates the definition of the division of tasks and responsibilities.

Day	Interaction designers (IxDs)	Visual designer (VisD)	Industrial designer (ID)
1	Design team briefing	Design team briefing	Design team briefing
2	Travel to client	Travel to client	Travel to client
3	Stakeholder kickoff	Stakeholder kickoff	Stakeholder kickoff
4	Stakeholder interviews	Stakeholder interviews	Stakeholder interviews
5	Stakeholder interviews travel home for weekend	Stakeholder interviews travel home for weekend	Stakeholder interviews travel home for weekend
6	Travel to location #1	Travel to location #1	Technology and trend re- search
7	User interviews	User interviews	
8	User interviews	User interviews	
9	Travel home	Travel home	
10	Local interviews (location #2)	Local interviews (location #2)	
11	Travel to location #3		Travel to location #3
12	User interviews		User interviews
13	User interviews		User interviews
14	AM: user interviews PM: travel home		AM: user interviews PM: travel home
15	Local interviews		
16	Competitive system review	Competitive system review	Competitive system review

Figure 5. Steps and schedule for short-term international student exchange (days 1 – 16).

5 CONCLUSIONS AND DISCUSSION

Lessons learned from the pilot: (1) Time: Due to the pilot nature of the project there were several open issues at the start. Overall timing of the project was too tight. The Laurea team had not finalized their service concept for SW development in a phase when the UAB team should have started their part. This posed challenges for the processing of the project. In practice even one additional week would have helped the teams to achieve targeted stage for the intensive week and the application testing, usability evaluation and visual fine tuning could have been completed. However, the students were able to complete all their tasks in time. A sprint with testing would have been good if time had been on the students' side. It also would have been fruitful to test the application with real users and use an iterative development process to improve usability based on real user feedback. The project team could also have finalized the visualization of the application. (2) Communication. The project team met through Skype eight times according to the agreed meeting agenda. Regular project meetings and formal and informal communication methods were used for concept development [10]. The concept was finetuned throughout the project according to the discussions in the project meetings as the team agreed to modify the concept according to suggestions by both UAB and Laurea team members. Regular project meetings served as a natural review point for application development and any encountered issues. The students noticed that they were working in a healthy process and most of the back and forth took place through good collaboration. [10]. As a result, this type of collaboration enabled the possibility of forming an innovative service that included input from students with a wide variety of backgrounds. (3) Goals. Even if the project faced different challenges during the process, the goals of the pilot were achieved. The main goal was to create a mobile application based on real customer needs and that goal was reached. (4) The results also indicate that the competences from Laurea and UAB are complementary. Although the pilot pointed out areas for improvement in the implementation of the joint project, it primarily encouraged the continuation and deepening of the cooperation. Thus, there are good preconditions for cooperation in the future.

Design management plays an important role in bringing service design principles to application development. It acts as a glue to tie the customer understanding and the software development together. This kind of bridging is essential for design culture and design thinking mindset creation to foster customer centricity in any company. Embedding design practices and iterative development principles into company culture are mandatory requirements to cope with the pace of the internet era and to stay competitive. Bringing agile principles right into the planning phase helps cut waste in the processes, reducing development cost and time while improving value creation and profitability. Including design management in a concrete, collaborative way as a part of studies both at Laurea and UAB increases the understanding of various aspects of international collaboration and digital service development from design perspective. It helps build concrete customer-centered design and development know-how that is essential in any company today.

In future collaboration projects, design management can be taken even further. Assuming the project will be conducted as part of project studies for a company, value can be achieved by estimating the commercial impact i.e., application market potential, commercial development feasibility, development cost, and other requirements, such as information security and GDPR aspects, etc. that must be considered when developing services for commercial use. This addition would anchor the design management studies even better to service design and software development reality. Extending a future study project to strategic design management perspectives would be interesting. That might give valuable insight to stakeholders: how to impact company image and competitiveness by design management.

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