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INTEGRATING TEACHING AND R&D IN HIGHER EDUCATION - THE WELIVE PROJECT

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Abstract

In order to respond to the challenges posed by digitalisation, new competence and operating models are required in working life. This, on the other hand, requires developing the content and methods of higher education. This paper describes an experiment that addresses developing higher education in service design studies at Laurea University of Applied Sciences.

The pedagogical starting point for the development work was a pedagogical model, Learning by Developing (LbD), that is based on learning through research and developing (R&D). Expertise and experiences are shared between teachers and students as well as other project partners. While working in the project teams, students take part as equal partners bringing their expertise with them. The teacher members of the project team take part by providing their expertise to steer the progress of the work and, at the same time, the progress of learning.

The objectives of the development work were: (1) to gain a research-oriented, developmental and problem-based higher education approach to studying; (2) to produce new methods and techniques to involve multidisciplinary students, citizens, companies, and the public and third sectors in the development of digital services; (3) to provide students with competence to use diverse development methods and tools flexible at all stages of the service design process; and (4) to provide students with competence to gather, structure and apply information in genuine R&D contexts. The development work focused not only on the pedagogical issues, but also on student and stakeholder participation in the innovation process, and on applying and developing appropriate service design tools and techniques for that purpose.

The development work was conducted during the multidisciplinary master's degree service design studies in the project called WeLive. The WeLive project was devised to transform the current e-Government approach by facilitating a more open model of design, production and delivery of public services leveraging on the collaboration between public sector, citizens and entrepreneurs. WeLive applies the service design approach to deliver next generation personalised digital services to citizens. For that, it contributes with the WeLive platform, an ICT infrastructure where stakeholders collaborate in the ideation, creation, funding and deployment of new digital services.

The outcomes of the development work were (1) a new teaching model in line with the service design process, with the aim of providing students with the ability to act as service designers and innovation processes developers, and (2) an open innovation process model to involve multidisciplinary students, citizens, companies, and the public and third sectors in the development of digital services.

Keywords: service design, innovation process, digital service, higher education.

1 INTRODUCTION

Countries, areas and cities are encountering fundamental socio-economic challenges such as demographic change, employment, mobility, security and many others. These fundamental challenges together with the squeeze of public finance mean a need for the modernisation of public administration by taking advantage of digital society. Moreover, the eGovernment approach is seeking to promote digital interaction between government and; (1) citizens, (2) employees, (3) businesses, and (4) other government agencies [1]. The Edition of the EU eGovernment 9th Benchmark report (2010) states that: "*service transformation paradigm is requirement that citizens and business, rather than administrative entities, must be focus of the service provision*" [2]. Moreover, the current public services are built following an administration-centric approach rather than according to the citizens' needs. Therefore, the European eGovernment Action Plan (2010) proposes that future services in public sector are needed to design, produce and deliver a more open model by involving and empowering citizens, entrepreneurs and civil society within [3]. Empowerment means increasing the capacity of citizens, businesses and other organisations to be pro-active in society through the use of new technological platforms and tools. Citizens and businesses are seen as an essential part of the response to the

socio-economic challenges. A new user-centric approach "will lead to a greater availability of services and improved service delivery, including greater personalisation of services, greater speed of delivery, more convenient access to services and longer hours of availability" [2]. Finally, in order to enhance an open model to design, produce and deliver public services, new competence (eSkills) and operating models are required in working life.

The WeLive project aims to transform the current administration-centric approach to build public services more into an open innovation process that enables easy involvement of citizens, employees, businesses, and government agencies. First, the WeLive project applies the service design approach with methods and tools to deliver next generation personalised digital services for citizens. For that, it contributes with the WeLive platform, an ICT infrastructure where stakeholders collaborate in the ideation, creation, funding and deployment of new digital services. The service design methods and tools enable to involve citizens and other stakeholders actively outside of the boundaries into the public sector innovation process. Furthermore, the service design methods help users and other stakeholders to express their feelings, experiences and knowledge and encourage them to take a role of expert and become part of a design team [4]. Second, the WeLive project provides a novel We-Government ecosystem of platform and tools built on the Open Data, Open Services and Open Innovation paradigms that is easily deployable in different public administrations and which promotes co-innovation of personalized public services through public-private partnership and the empowerment of all the stakeholders to actively take part in the value chain of a territory or a city. Through an open innovation process that includes service design methods and tools together with We-government ecosystem platform and tools, the WeLive project aims to contribute to two societal (S0) and four technical (T0) challenges: (S1) To promote the economic growth and job creation with added-value vertical apps and datasets, (S2) To increase transparency and trust in public administrations through new datasets and apps, (T3) To provide holistic support for the Open Innovation process of public services, (T4) To streamline the exploitation of Open Data from public services, (T5) To democratize creation of novel public services, (T6) To enable personalization and analytics of public services.

The open innovation process, presented by Chesbrough (2003), provides a framework [5] for the WeLive project to involve citizens, businesses, government agencies and academia in the innovation process aims to design, produce and deliver future digital public services. In turn, service design methods and tools are appropriate vehicles to engage people with the innovation process. Furthermore, the service design approach will be enhanced throughout the complete WeLive project life cycle in which stakeholder involvement, user-centered research, user-driven innovation, co-creation methodologies, and early phase evaluation will have a central focus.

2 SERVICE DESIGN APPROACH

The digital revolution has raised new challenges for service design. While services have become the most important economic power in the world, at the same time the nature of services and the pace of change have shifted dramatically. The service design approach is both a set of methods for service designers as well as an emerging academic field of design research [6, 7, 8] with a focus on complex and interactive experiences and processes. 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. It is strategic approach that helps providers to develop clear strategic positioning for their service offerings. Services are systems that involve many different influential factors, so service design takes holistic approach in order to get an understanding of the system and the different actors within the system.*" [9]. The service design approach provides a practical set of methods and tools to involve users in the service innovation process, explore users' world, and, eventually, design for user experiences. Also, the service design methods have proven to be very powerful in bringing users and user experience into the focus of service development.

2.1 Service design thinking

Stickdorn and Schneider (2011) discuss the five core principles of service design thinking: (1) user-centered; (2) co-creative (3) sequencing; and (4) evidencing, and (5) holistic. Next, these principles are described in more detail [10].

(1) The user-centered design approach is based on the principles that are defined in "Human-centered design for interactive systems" [11] and that can be summarized as follows: the design is based upon an explicit understanding of users, tasks and environments; users are involved throughout the design process; the design is driven and refined by user-centered evaluation; the process is iterative by

nature; the design addresses the whole user experience; and the design team has multidisciplinary skills and perspectives. [11]. (2) In value co-creation, the service company and its customer are together creating value for the customer, as well as for the service company (e.g. Gupta & Lehman 2005, Ramaswamy & Gouillart 2010). (3) The service processes can be divided into single touch points, when interaction between the service provider and the customer takes place. According to service design thinking, these service moments should be visualized and organized as a sequence of interrelated actions, enabling a pleasant rhythm and progress of the customer's mood by communicating the story inherently to the service through each touch point. (4) Due to the intangible nature of service, physical evidence or artefacts can enhance the customer experience by triggering positive associations and memories about the service moments. Tangible service evidence (such as souvenirs, brochures, or signs) can prolong the service experiences from the actual service period far into the post-service period, potentially increasing customer loyalty and engagement. (5) The wider context of the environment, in which the service process takes place, should be considered in service design. The service designers should understand and be consciously aware of what the customers may subconsciously perceive through their senses from the entire service environment. These subconscious perceptions can have a profound impact on the service experience. When designing a detailed touch point, it is necessary to understand the whole customer journey and to know where this particular touch point lies in relation to the entire customer experience. [10].

2.2 Service design process

It is impossible to provide a simple and easy to follow process model that would ensure the success of every service design project [12]. There are several service design process models or frameworks (e.g. IDEO 2001, Moritz 2005, Stickdorn & Schneider 2009, Liedtka & Ogilvie 2011) consisting of three or even up to seven stages, but fundamentally all service design processes share the same logic and mind-set. Service design processes are usually presented to have a clear and chronological structure, but in reality the service design processes are nonlinear and iterative by nature. [10, 13]. Each service design process model is complementary to existing design methodologies and provides a service design thinking perspective that can be integrated into different design and development processes in a way that is appropriate to the particular context. In other words, various tools and methods can be used in each stage, depending on the desired outcome. One of the most well-known and used service design processes is the Double Diamond Model by the British Design Council (Fig. 1). The process has been divided into four distinct phases; (1) Discover; (2) Define; (3) Develop; and (4) Deliver. (1) In the Discovery phase the designer identifies the problem, opportunities and need to be addressed through design, defines the solution space and builds a rich knowledge resource with inspiration and insights. (2) The Define stage acts as a filter in which the outputs of the previous phase are reviewed and analysed and the findings are synthesized into a reduced number of opportunities. Furthermore, the designer defines a clear brief for sign off by all stakeholders. The main activities in (3) the Definition phase are to develop the initial brief into a product or service for implementation, to design service components in detail and as part of the holistic experience, and finally to iteratively test concepts with end users. In the last phase, (4) the Deliver stage, the final solution concepts are taken through final testing, signed-off, produced and launched. [14].

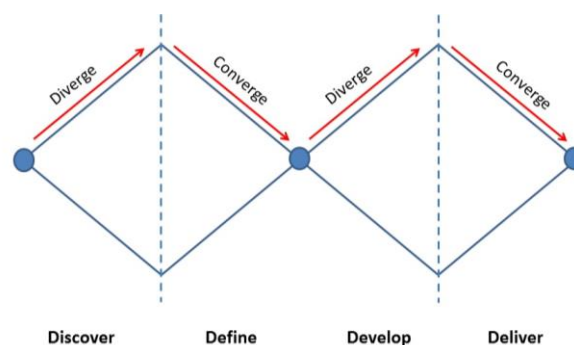


Fig. 1. The Double Diamond process by British Design Council [14].

In this development work we will follow the Double Diamond model, because it describes the design process as a continuum of few overlapping phases, not as a sequence of distinct and strictly defined steps happening in an orderly manner. In other words, it is flexible enough and thus appropriate for designing evolving multichannel services where digital technology plays a significant role.

2.3 Service design methods

Service design has adopted methods from several fields [8]. Hanington (2003) divides the user research methods into three categories: (1) Traditional methods, including market research, focus groups, surveys and interviews. The data acquired through these methods provides a good overall view of the design field, but it does not fulfil the needs of service design, because generalisations fail to define individual and exceptional properties; (2) Applied methods, which refers to using research methods from different disciplines in design research. Applied methods are usually qualitative methods of ethnography, sociology and culture studies, including observation, self-documentation and interaction methods such as thinking aloud or heuristic evaluations; and (3) Innovative methods, which are particularly suitable at the beginning of the service design process, because they are used to gain an understanding of people's emotions, feelings of pleasure, values and dreams [15].

Sleeswijk Visser et al. (2005) divide methods into three categories according to the focus of the method: say/think, do/use and know/feel/dream. "Say/think" relates to interviews and to explicit knowledge, whereas "do/use" relates to observing the situation of usage. "Know/feel/dream" refers to physical or visual aids to allow people to visualize and describe their expectations and dreams, or tacit knowledge [4]. The focus of service design has shifted towards more creative approaches which seek to understand people's subjective values, attitudes and desires.

The service design approach favours innovative research methods because research data gathered by these methods provide stimuli that allow ideas and insights to be created and opportunities to share them [16]. These methods are meant to support both the designers and the users in their creativity and interpretations during the service design process.

2.4 Towards a more open model of designing digital services for citizens

The current administration-centric approach to designing digital services for citizens gives actual users none or very limited role in the service innovation process. Often, when citizens are taken into account in the innovation process, they are presented with solutions and are then given the opportunity to comment on them [17]. However, the digital services in public sector are needed to design, produce and deliver a more open model. WeLive bridges the gap between innovation and adoption of public digital services by combining the service design approach with the Open Government process. Empowerment that can be achieved through the combination of the above-mentioned approaches will increase the capacity of citizens, businesses and other organisations to be pro-active in society and also facilitate democratic thinking. Finally, Nabisan (2008) defines the benefits of network-based collaborative innovation as follows: "*an externally focused approach to innovation and problem solving that relies on harnessing the resources and capabilities of external networks and communities to amplify or enhance innovation speed and innovation outcomes*". [18].

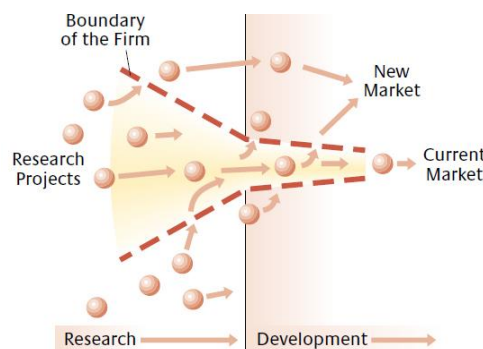


Fig. 2. Open innovation process presented by Chesbrough [5].

The open innovation process (Fig. 2) provides a framework for the private sector to involve actual customers and even other companies in their innovation process. Many industries are currently moving from closed to open innovation when they have realized the benefits by opening their innovation process and letting other parties to involve their R&D operations. According to Chesbrough (2003) two main factors can be found why companies' close innovation process has faced challenges at the end of the 20th century: 1) Companies have difficulties in controlling knowledge workers' proprietary ideas and expertise, 2) Starts-ups are able to get finance more easily for the ideas that have spilled outside of the corporate research labs. [5]. On the other hand, the open innovation model means decreasing R&D costs for companies because they are able to benefit from other parties'

innovations and vice versa. Also, there is no need to hire a variety of competence to the company. The open innovation process, which was originally developed for the use of companies, has been recently also implemented in public sector (e.g. Hilgers & Ihl, 2010; Mergel & Desouza, 2013; Feller & Finnegan & Nilsson, 2011; Bakici, T., Almirall, E., & Wareham, J., 2013). It has led to Open Governance, which main objectives are promoting transparency, participation, and collaboration between the governance and its citizens. [19]. In the WeLive project, the open innovation process works as a framework for Open Government and service design methods and tools are appropriate vehicles to engage citizens, businesses, government agencies and academia in the innovation process to express their feelings, experiences and knowledge and encourage them to take a role of expert and become part of a design team.

3 PROGRESS OF THE DEVELOPMENT WORK

The purpose of the development work was not only to integrate teaching and R&D, but also to find new ways to enhance stakeholder participation in the innovation process and thus to benefit the WeLive project. The pedagogical starting point for the development work was the LbD pedagogical model, which is based on learning through research and developing. Learning in the LbD model is built on team work. Expertise and experiences are shared between teachers and students as well as other project partners. While working in the project teams, students take part as equal partners bringing their expertise with them. The teacher members of the project team take part by providing their expertise to steer the progress of the work and, at the same time, the progress of learning. In the LbD model, learning is not restricted by the limitations of the curriculum, textbook or exercise book.

The service design approach combined with the open innovation model constitutes the theoretical frame of reference for the development work. The objectives of the development work were: (1) to gain a research-oriented, developmental and problem-based higher education approach to studying; (2) to apply service design methods and techniques to involve multidisciplinary students, citizens, companies, and the public and third sectors in the development of digital service; (3) to provide students with competence to use diverse development methods and tools flexible at all stages of the service design process; and (4) to provide students with competence to gather, structure and apply information in genuine R&D contexts.

3.1 Preparation for the integration of teaching and R&D

The web based survey was published in the early phase of the WeLive project to collect initial information about users' and stakeholders' needs, hopes and wishes regarding future digital services. The survey method enables involving through web based channels a high number of citizens and stakeholders and thereby obtaining a large quantity of information. The WeLive design game, which was based on the results of the survey, was created by the teachers who were also involved in the project as researchers. The design game helped to facilitate a service design process for cross-disciplinary design groups early in the design process. Moreover, the design game enabled framing collaborative design activities in a game format, arguably improving idea generation and communication between citizens, public administration and companies.

There is no generally accepted definition for the concept of design game. Instead, there are several different descriptions of the characteristics of design games. Most descriptions agree that design games are about staging participation, that there is seldom competition over who wins the game and that there are rules and tangible game pieces that guide the design moves [20, 21]. Design games are not games in a traditional sense, because the application area of early concept search and co-design define them. Vaajakallio (2012) identifies two basic components of design games, context and play-qualities, which define them. Instead of being a well-defined method, design game is an expression that emphasizes the exploratory, imaginative, dialogical and empathic aspects of co-design. The objectives of applying design games are rooted in the design context. Design games are tools for co-design that purposefully highlight play-qualities such as a playful mind-set and structure, which are supported by tangible game materials (e.g. game board, playing cards, and pieces) and rules [21]. The objectives of the design games are to inspire design and to help facilitate a participatory design process. Framing collaborative design activities in a game format improves idea generation and communication between stakeholders. By shifting focus to the game, power relations and other factors that might complicate idea generation are downplayed. [20].

The WeLive design game was planned to further develop the ideas gathered from the survey as well as to involve different target groups in the collaborative design workshops of future digital services.

The design game included material designed for the purpose (e.g. poster, different kinds of playing cards, rules and game instructions). Altogether, four design game sessions were arranged before integrating the project into teaching. Each game session was attended by citizens and representatives from companies and public administration.

3.2 User-Centered Design of Digital Service

In order to carry out the development work, we arranged a practical experiment that integrated the WeLive project and implementation of the study unit called User-Centered Design of Digital Service (10 cr). The objective of the study unit was to provide students with: (1) an ability to apply general practices of User-Centered Design (UCD) in students' own discipline; (2) an ability to integrate user and customer expertise to the different stages of the design process; (3) an understanding of the basic principles of user interface (UI) design and interaction design; (4) an ability to apply the service design methods and techniques for digital service planning; (5) an understanding of the principle of ensuring usability of digital services; and (6) an ability to act and develop services in open innovation networks and environments. The experiment had a dual purpose: the task for the student groups was firstly to involve user groups in the service design process of future digital services, and secondly to create a new digital service concept that meets the needs, hopes and wishes. During the study unit, the student groups worked on three levels, which were: (1) studying the service design process, methods, and tools, as well as their theoretical backgrounds; (2) applying the theory in practice; and (3) evaluating the theory, models, development process, practice, and tools. The structure for the study unit trails the Double Diamond Model. In the following chapters the phases are explained in more detail.

In the **Discover phase** we used the WeLive game to inspire the multidisciplinary student groups to ideate open data based digital services. The pedagogical objectives of the design gaming were: (1) to introduce students to real Service Design practices used in the WeLive project; (2) help students to reach the effective teamwork stage early in the course; and (3) to enable innovation of a team-specific digital service idea to be developed later during the course. In addition, design game provided a practical introduction to the WeLive project and helped students to form a group. According to Wheelan (1994) forming a group has the following general stages: (1) Dependency and Inclusion, (2) Counterdependency and Fight, (3) Trust/Structure, (4) Work/Productivity .[22]. Since group work is also an important part of the LbD methodology, helping students to form an effective and productive study group is essential. A design game session at the very beginning of the course seemed to give students the possibility to reach productive goals by collaborative work in the first stages of group forming. Since all teams were also able to innovate a new digital service idea, the game session gave each student team a specific development goal for rest of the study unit (Fig. 3). As a result of the design game, the student groups described their idea of new digital services ideas by scenarios and needed data assets.



Fig. 3. The WeLive design game.

Next, the multidisciplinary student groups aimed to identify the design problem, or opportunity and the solution space. In order to build a rich knowledge resource with inspiration and insights gained of potential users' and stakeholders' needs, hopes and wishes regarding future digital services, the student groups conducted user studies. They applied service design methods and techniques to involve citizens, companies, and the representatives of public and third sectors in the developing of digital services in authentic R&D contexts.

In the **Define phase**, the student groups analysed the qualitative data gathered in the Discover phase and synthesized the findings into a reduced number of opportunities. Based on the results and findings of the user studies the students ideated new digital service concepts. Altogether 18 initial digital service concepts were created. Various kinds of visualization tools and techniques were used to outline the new ideas and new digital service concepts. The student groups gathered first feedback on their concepts from their peers as well as from the WeLive project partners.

Based on the first gathered feedback the student groups further developed their digital service concepts in more detail in **the Develop phase**. In order to iteratively test (e.g. interaction, usability and graphic) their concepts with users they produced the first paper and functional prototypes (Fig. 4).

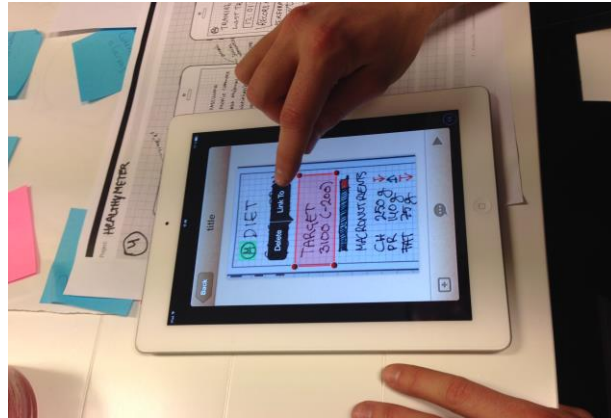


Fig. 4. A functional prototype of a digital service.

The final concept will be presented for the WeLive project partners, potential end users and other stakeholders (e.g. companies, public and third sector representatives) on December 16th, 2015 in the WeLive seminar. Finally, the student groups will evaluate the theory, models, development process, practice, and tools in their final reports. The decision of potential service implementation will not be included in the study unit, but will be left for the public sector and the companies to do (**in the Deliver phase**).

4 THE RESULTS OF THE DEVELOPMENT WORK

The development work focused not only on the pedagogical issues, but also on student and stakeholder participation in the innovation process, and on applying and developing appropriate service design tools and techniques for that purpose. The outcomes of the development work were: (1) a new teaching model in line with the service design process, with the aim of providing students with the ability to act as service designers and innovation processes developers, and (2) an open innovation process model to involve multidisciplinary students, citizens, companies, and the public and third sectors in the development of digital services.

4.1 New teaching model

The new teaching model (Fig. 5) is based on and follows the phases defined in the well-known Double Diamond process model; discover, define, develop, and define. In the teaching model citizens are invited to participate in an open innovation process in partnership with multidisciplinary students, companies, the public and third sectors. The purpose of the development work was not only to produce service design competence for students and offer them a unique opportunity to participate in the development of a new kind of innovation culture, but also benefit the R&D project by employing students' multidisciplinary competences to enrich research and development activities. Thus, all the phases of the process include diverse objectives for the development and for learning processes.

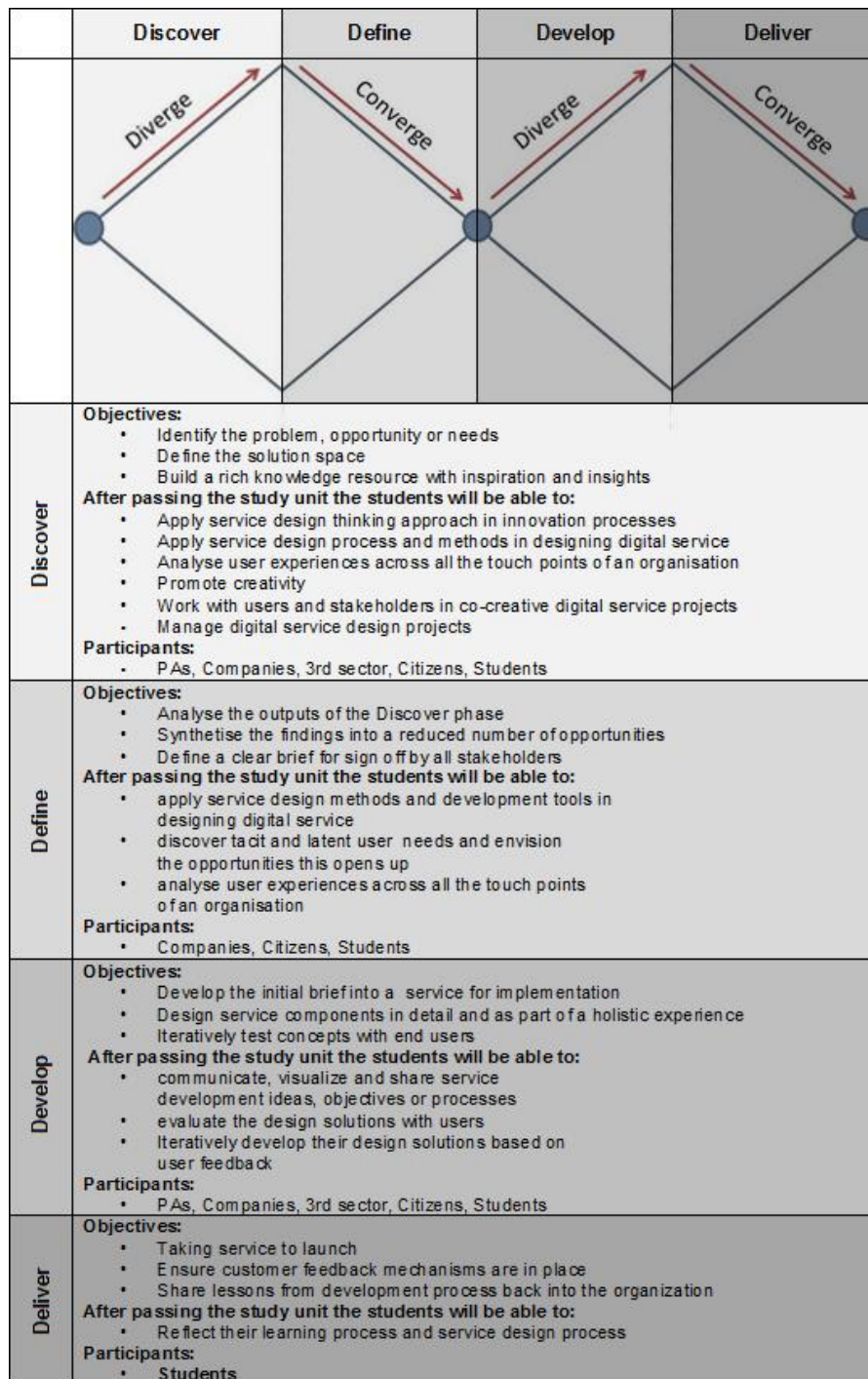


Fig. 5. The new teaching model.

4.2 Open innovation process model

In the WeLive open innovation process (Fig. 6), citizens are involved from the beginning, in partnership with students, public sector and experts. The WeLive open innovation process will focus on transferring the ideas from innovation to adoption, by democratizing the service creation process and fostering public-private partnership that will jointly exploit the outcomes of the open innovation process. Moreover, citizens, companies, public sector and students can collaborate during every phase of the public service delivery, e.g. discover, define, develop, and deliver by generating new public service ideas, voting, selecting and funding them as well as taking part in implementing and promoting new services (Tab. 1). The WeLive open innovation process works as a framework for Open Government and Double Diamond gives a guideline for different phases and service design methods and tools are appropriate vehicles to engage stakeholders with the open innovation process.

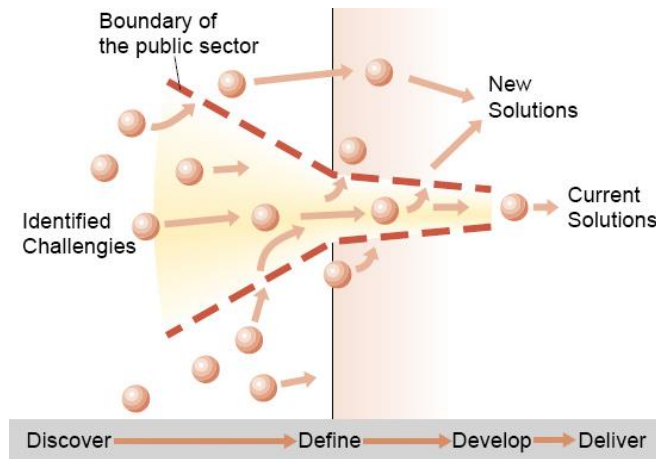


Fig. 6. Modified from original open innovation process presented by Chesbrough (2003).

Citizens	<ul style="list-style-type: none"> • Give initial service ideas and voting for the best ideas • Participate in the contests created by public sector • Exploit the ideas that have spilled outside boundaries of the open innovation process • Provides crowd-funded investment to foster the interesting service ideas
Public sector	<ul style="list-style-type: none"> • Orchestrates the open innovation process and facilitates the platform and tools of the ecosystem • Identifies socio-economic challenges and provides them as a starting point for the innovation process • Provides Open Data to support novel application creation (the ecosystem is built on the Open Data paradigms) • Organizes contests to motivate and facilitate innovative use of open data • Launches calls for developers for big projects that are important for the community • Provides funds for the most potential ideas that helps to reduce the squeeze of public finance • A way to facilitate democratic thinking by 'bottom up' approach
Companies	<ul style="list-style-type: none"> • Exploit the ideas that have spilled outside boundaries of the open innovation process • Get finance for their service ideas • Participate in the contests and calls created by public sector
Students	<ul style="list-style-type: none"> • Participate from the beginning in the open innovation process to discover and define socio-economic challenges, and develop initial ideas in iterative process • Potentially take their service ideas further in the deliver phase • Utilise new competence (eSkills) how to innovate digital public services together with citizens, companies and public administration • Encourage their working life to benefit the ideas that have spilled outside of the innovation process's boundaries • Exploit the ideas that have spilled outside boundaries of the open innovation process

Table 1. Citizens, companies, public sector and students can collaborate during every phases of the public service delivery

5 DISCUSSION

In order to respond to the challenges posed by the digital revolution, new competence and operating models are required in working life. This requires developing the content and teaching methods of higher education. Laurea University of Applied Sciences is focused on service innovations. Laurea's pedagogical model Learning by Developing (LbD) is based on learning through R&D. The LbD-based innovation process enables rich interaction with end users, companies, and the public and third sectors in the R&D projects.

The results achieved by students in the R&D projects exceed the targets set for their studies. The integration of learning and R&D activities and collaboration within international partner network in the R&D projects provide a new, motivating dimension. For students these partner networks are a natural channel for networking. On the other hand, the R&D projects benefit from employing students' multidisciplinary competences to enrich their R&D activities.

The most important outcomes of the development work are: (1) a new teaching model in line with the service design process, with the aim of providing students with the ability to act as service designers

and innovation processes developers, and (2) an open innovation process model to involve multidisciplinary students, citizens, companies, and the public and third sectors in the developing process of digital services. Together those outcomes form a dualistic innovation model, which describes Laurea's way of integrating the three tasks of a university of applied sciences – education, R&D and regional development. This way seems to be highly suited to the open innovation philosophy.

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