

Master's thesis

Master of Business Administration

Leadership and Service Design

2020

Oluwaseun Orisakwe & Marianne Taponen

DESIGNING A CIRCULAR ECONOMY LEARNING ENVIRONMENT

– Topinpuisto Learning Platform



MASTER'S THESIS | ABSTRACT

TURKU UNIVERSITY OF APPLIED SCIENCES

Master's Degree Programme in Leadership and Service Design

2020 | number of pages: 114, number of pages in appendices: 15

Oluwaseun Orisakwe & Marianne Taponen

DESIGNING A CIRCULAR ECONOMY LEARNING ENVIRONMENT

- Topinpuisto Learning Platform

This Master's thesis focuses on developing the Topinpuisto learning environment and especially their learning platform together with the key stakeholders. Topinpuisto is a circular economy hub that aims to create a seamless network between circular economy actors and universities and, via the learning environment, provide possibilities for unique learning experience and business development. The aim of the research was to improve Topinpuisto learning platform and its existing backend processes. The goal was to create an effective and efficient visual user interface for the learning platform, which would reflect user needs and aspirations as well as help users to collaborate efficiently in the platform. Another goal was to provide Topinpuisto a structured view for the learning environment, through which they would be able to develop their processes.

The theoretical background of the study focuses on circular economy and learning platforms, explaining circular economy from global to grassroots and providing an outlook for the future. The current trends of learning platforms and the importance of using universities as a driving force for circular economy are discussed. The study adopted a double diamond model to understand the gaps in the organization's current processes, to study the challenges and motivations of the service users and thereafter brainstorm and ideate with stakeholders to create a more valuable service concept. In benchmarking the current Topinpuisto learning platform, actors were selected within circular economy and outside the industry; the aim was to gather elements common in most platforms that could be adopted for improvement. Users' needs and aspirations were gathered with semi-structured interviews. Service design tools and methods were widely adopted in the research and a stakeholder map, personas, customer journey maps, value proposition canvases, a service blueprint and a moodboard were created to further visualize various aspects of the users' needs and ways of improving communication and seamless collaborations among the stakeholders.

The study revealed that more collaboration is possible between the stakeholders if adequate information and expertise is available on the platform. Again, a standard schedule would aid Topinpuisto employees to better manage the learning platform and could extend the circular economy network effortlessly. In addition, the study showed a critical need for an improved learning platform. The information gained from interacting with the stakeholders was used in creating a prototype learning platform that is robust and more engaging, as well as a year clock to standardize Topinpuisto back end processes.

KEYWORDS:

Learning environment, learning platform, circular economy, service design

CONTENT

VOCABULARY	6
1 INTRODUCTION	7
2 COMMISSIONER AND GOALS OF THE PROJECT	9
2.1 Presentation of the commissioner and the problem area	9
2.2 Aim of the project and research questions	10
2.3 Student research projects	11
3 RESEARCH DESIGN	13
3.1 Frame of reference	13
3.2 Service design process and research methods	14
4 CIRCULAR ECONOMY AND LEARNING ENVIRONMENTS	16
4.1 Introduction	17
4.2 Global processes	19
4.2.1 United Nations and European Union	23
4.3 Circular economy in Finland	24
4.3.1 Sitra: Finland's main organ for circular economy	24
4.3.2 Circular economy and waste management in Turku	27
4.4 Universities as driving force for circular economy implementation	29
4.5 Online learning environments and digital platforms	30
4.6 Future of circular economy	32
5 RESEARCH AND GATHERING INSIGHTS	37
5.1 Preliminary research	37
5.1.1 Stakeholder map	37
5.1.2 Benchmarking	39
5.2 Identifying service users and the service journey	45
5.2.1 Interviews of service users	45
5.2.2 Personas	55
5.2.3 Customer journey map	58
6 IDEATION OF THE LEARNING ENVIRONMENT	65
6.1 Value proposition canvas	65

6.2 Learning platform ideation with stakeholders	69
6.2.1 Task 1: Project assignments and student projects	70
6.2.2 Task 2: Project categorization	74
6.3 Summarizing results	76
6.3.1 Project cooperation and executing projects	76
6.3.2 Learning platform	78
7 DESIGN OF THE LEARNING ENVIRONMENT	82
7.1 Organizational improvements	82
7.1.1 Service blueprint for Topinpuisto learning environment	83
7.1.2 Year clock for the Topinpuisto organization	85
7.2 Learning platform prototype	87
7.2.1 Moodboard of the learning platform	88
7.2.2 Learning platform visualization	89
7.2.3 Refining the platform prototype	102
8 CONCLUSIONS	104
REFERENCES	109

APPENDICES

Appendix 1. Organizations reviewed in benchmarking	
Appendix 2. Interview questions	
Appendix 3. Brainstorming the learning platform	
Appendix 4. Learning platform prototype visualization	
Appendix 5. Modified learning platform prototype visualization	

FIGURES

Figure 1. Categorized student work.	11
Figure 2. Frame of reference.	13
Figure 3. Service design process.	14
Figure 4. Circular economy business examples in Finland collected by Sitra (Sitra 2019c).	27
Figure 5. Subjects and objects in implementing University Circular Economy Education (UCEE) (Qu & Shevchenko 2019).	30
Figure 6. Three scenarios towards future of circular economy.	34
Figure 7. Break down of plastics in the ocean (Futuretimeline 2020).	35

Figure 8. Stakeholder map of Topinpuisto learning environment.	38
Figure 9. Learning environment frontpage (Topinpuisto 2020c).	40
Figure 10. Learning environment contact form (Topinpuisto 2020b).	41
Figure 11. Summary of learning platform elements.	43
Figure 12. Pros and cons of learning platforms.	44
Figure 13. Current experience and communication with Topinpuisto.	48
Figure 14. Objectives and motivation for cooperation.	50
Figure 15. Challenges in cooperation.	52
Figure 16. Aspects on the learning platform.	54
Figure 17. Persona 1, Development manager.	56
Figure 18. Persona 2, Entrepreneur.	56
Figure 19. Persona 3, Lecturer.	57
Figure 20. Customer journey for companies: information and assignment phases.	60
Figure 21. Customer journey map for companies, project phases.	61
Figure 22. Customer journey map for lecturers, information phase.	62
Figure 23. Customer journey map for lecturers, agreeing on assignments.	63
Figure 24. Customer journey for lecturers, project phases.	64
Figure 25. Value proposition canvas for companies.	67
Figure 26. Value proposition canvas for educational institutions.	68
Figure 27. Dreamers view for cooperation and student projects.	71
Figure 28. Realist view for cooperation and student projects.	72
Figure 29. Critics view for cooperation and student projects.	73
Figure 30. Detailed project categorization.	75
Figure 31. Benefits and drawbacks of project categorization.	75
Figure 32. Project management improvements.	77
Figure 33. Learning platform elements.	79
Figure 34. Service blueprint for Topinpuisto learning environment.	83
Figure 35. Year clock for the Topinpuisto organization.	86
Figure 36. Moodboard of the learning platform.	89
Figure 37. Learning platform sketches.	90
Figure 38. Learning platform landing page.	91
Figure 39. Circular economy project work.	92
Figure 40. Information for companies.	93
Figure 41. Project categories.	94
Figure 42. Circular economy themes.	94
Figure 43. Contact information.	95
Figure 44. New assignments or project needs.	96
Figure 45. Project assignment forms.	97
Figure 46. Available projects and project needs.	98
Figure 47. News and collaboration.	99
Figure 48. Finished projects.	100
Figure 49. Reporting a finished project.	100
Figure 50. Future circular economy.	101
Figure 51. Modified future circular economy block.	103

VOCABULARY

Co2	Carbon dioxide
Educational institution	Any institution dedicated to education regardless of the level of education, for example school, university or college (Statistics Finland 2020).
EU	European Union
GHG	Greenhouse gas
IoT	Internet of Things
Learning environment	An educational approach referring to a diverse physical location, context and culture in which students learn (Edglossary 2013).
Learning platform	A learning management system or online service that provides information, tools and resources for teachers, students and others involved in education (Piotrowski 2010).
LSJH	Lounais-Suomen Jätehuolto
Sitra	The Finnish Innovation Fund Sitra
UCEE	University Circular Economy Education
UN	United Nations
WCEF	World Circular Economy Forum

1 INTRODUCTION

Human organizations can only be relevant when they are abreast of development around them and upgrade to meet up with the ever-changing world. Today, there is a need to save the Earth, as there is now a constant increase of degradation because of exploitation of planet resources. Thesis commissioner Topinpuisto remains relevant having done several projects in this regard. It is presently involving in the end of life textile processing but also wishes to continue spreading its business in the world of circular economy, by exploring ways businesses could utilize the circular economy in Finland. (Topinpuisto 2020a.)

Topinpuisto aims to broaden its horizon in circular economy, and in achieving this, it wants to be involved in several projects from different companies and educational institutions. Topinpuisto is a circular economy platform that promotes business on circular economy eco system. It wants to offer a diverse range of opportunities for cooperation as well as business oriented projects with flexible timetables. They work in cooperation with different educational institutions and provide a platform for trainees and companies to collaborate on research projects and engage with circular economy and resource efficiency. This cooperation is taking place via Topinpuisto learning environment. (Topinpuisto 2020a.)

This thesis focuses on developing Topinpuisto learning environment and especially their service delivery and learning platform. The aim of this research is to improve the Topinpuisto learning platform and its existing backend processes. Service design approach is applied in examining the current status of Topinpuisto learning environment and service delivery. Customer orientation helps in discovering the different problems faced by stakeholders and in understanding their expectations and aspirations towards Topinpuisto. Stakeholder aspects and views are used to construct a template for an enhanced learning environment and a new learning platform.

Several methods are used to reach the aim of the thesis: desk research and document analysis are used to map the current status and benchmarking with similar services sets a baseline for the platform. Furthermore, semi-structured interviews, brainstorming and ideation workshop with stakeholders are used to collect user experiences and pain points from the current cooperation as well as to ensure user perspective in designing the service improvements. Regular meetings with the commissioner representatives

throughout the whole research process ensure that the commissioner's needs and aspirations are taken into consideration.

The second chapter presents Topinpuisto as a commissioner and explains more in detail the aim of thesis as well as research questions. The chapter also contains a desk research conducted in the early phase of the research. This focuses on categorizing all student works done for Topinpuisto since 2016. The third chapter describes the research design, which includes frame of reference and service design process with regards to the tools and methods. The research adopts double diamond concept for gaining insights and providing improvements to the learning environment. Chapter four presents the theoretical background for the research. Theoretical focus is on explaining circular economy from the global perspective to grassroots, the importance of using educational institutions as a driving force for circular economy and current trends and expectations in learning platforms. An outlook to the future of circular economy is also provided.

The fifth chapter presents the research process and data gathering of relevant information. It presents the preliminary research process of forming a stakeholder map and benchmarking against other learning platforms in circular economy and educational fields. The main research process concentrates on identifying service users and the service journey and it contains interviews and construction of personas and customer journeys. The sixth chapter presents the ideation stage, where attention is on finding solutions to the problems and issues identified. The learning environment service is examined with value proposition map for finding essential values and elements of the service, which bring value to customers. Stakeholder workshop is another continuation for the ideation where the service users participate in ideating solutions to the learning platform. The chapter also summarizes the results both from the research and the ideation phase.

The seventh chapter focuses on prototyping the learning environment and incorporating all research results and ideas in the prototype. Building of prototypes aims to improve both Topinpuisto back end processes and the actual learning platform. Organizational improvements are prototyped by constructing a service blueprint and a year clock for Topinpuisto. Learning platform is prototyped by constructing a moodboard and an actual wireframe of the improved Topinpuisto learning platform page. The last chapter is conclusions, which summarizes the research, answers to the research question and presents lessons learnt as well as suggestions for further studies.

2 COMMISSIONER AND GOALS OF THE PROJECT

This chapter presents the commissioner and the learning environment service. It shortly describes the problem area and then presents the aim of the project as well as the research questions. It also presents a desk research done in the beginning of the project, where the already done student works for Topinpuisto are analyzed and categorized.

2.1 Presentation of the commissioner and the problem area

Topinpuisto is a network of diverse businesses and research institutes, ensuring a link within region to national and international collaborations. The network acts responsibly and respecting the environment. Utilization of materials, energy flows and water form the basis of collaboration and service development. The vision is to provide services that support the development of circular economy while providing companies growth opportunities as well as possibilities to test and commercialize new business operations. The collaboration is open and varies based on the needs of the companies. The development of Topinpuisto is coordinated by Lounais-Suomen Jätehuolto (LSJH), which is a municipal waste management company in Southwest Finland. Development work is carried out through the support of the whole Topinpuisto circular economy network. (About Topinpuisto 2020.)

There has been different types of cooperation around circular economy since 2006 but Topinpuisto was officially launched in Turku in 2016. Since then, it has been functioning with a network of about 17 organizations implementing an efficient public-private cooperation in circular economy and waste management. Topinpuisto has specialized in municipal and company waste management, textile recycling and other environmental friendly practices. They use research and development projects to collaborate with companies as well as giving platform for university students for gaining practical, hands on, experience. (About Topinpuisto 2020.)

The current processes how Topinpuisto offers the circular economy hub services are not optimal and the available structure of the learning environment is weak. Topinpuisto is presently having challenges in categorizing the needs of its clients and partners, as well as with the ability to meet their needs as soon as possible. They have a learning platform in their internet site but this page contains very limited amount information. Currently, in

the assignment matching process, there has been a number of times that mails are sent around and information is passed between two or more officials before an agreement can be reached, as to what kind of project is available or how much time or fund is needed to accomplish a task. This expectedly creates a bottleneck of bureaucracy that is detrimental to efficacious service delivery and it does not serve well their goal to be able to engage in numerous projects with various companies. (J. Liipola, personal communication, 3.3.2020.)

Topinpuisto has recognized this problem and is aware that with the current service model they are neither meeting the customers' expectations nor having efficient internal processes to provide the service. With the expansion of the circular economy hub, there is a need to also redesign the learning platform in a manner that can accommodate more information and is easily accessed by all collaborators. Goal of the project is to have a platform where tasks can easily be categorized and assigned, outcomes and utilization of projects can be updated, and responsibilities and client's requests can be spelt out. Therefore, this study will examine the current status of Topinpuisto learning hub with a view to discovering the different problems faced by all collaborators and proffering a template for enhanced learning platform that will eliminate these problems and improve the learning platform.

2.2 Aim of the project and research questions

The aim of this research is to improve the Topinpuisto learning platform and its existing backend processes. The objectives of this project are to examine the current Topinpuisto service delivery process and needs of users, and based on these to develop the learning environment service. Goals are to create an effective and efficient visual user interface for the learning platform, which helps users to efficiently match assignments and collaborate in the platform. Another goal is to provide Topinpuisto a structured view for the learning environment service, through which they can develop their backend processes.

The main research question for the thesis is: What kind of a learning platform is suitable for Topinpuisto's stakeholders and helps to improve processes of Topinpuisto?

The supportive research questions, which help to answer the main questions, are:

- How does Topinpuisto learning platform deliver its services to clients currently?
- How can Topinpuisto clients conveniently access information from the learning platform and how do the users want to be attended to?
- What kind of learning platform fills the needs of the clients?
- What kind of functionalities are needed in the learning platform user interface?

2.3 Student research projects

In order to improve on the Topinpuisto learning platform, it was essential to do a desk research about the current themes and Topinpuisto’s interest in circular economy matters. The organization representative, Johanna Liipola provided a list of student project works done for Topinpuisto between 2016 and 2019. The list contained over thirty student projects, these were mainly theses but workshop and internship reports or research presentations were also included. Researchers reviewed these projects and based on the topic and summary of the project, further categorised them under four thematic areas that group these projects under common, descriptive, headers. The proposed categorization was also discussed and reviewed with the commissioner representative Johanna Liipola. The categorization and titles of the student works are presented in Figure 1.

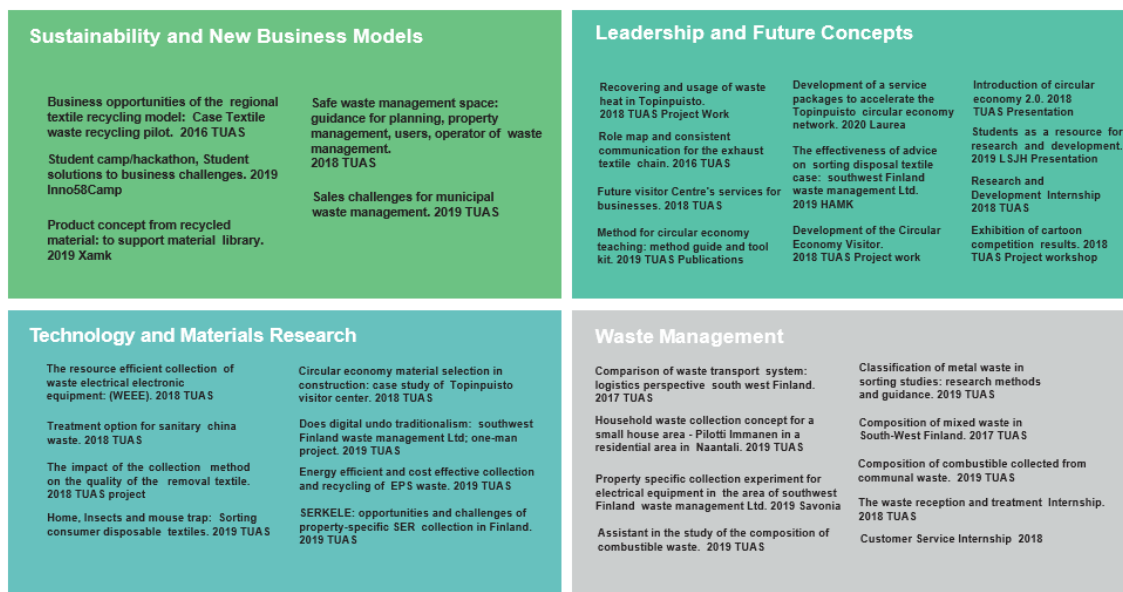


Figure 1. Categorized student work.

The student works were divided in four thematic themes. First theme is sustainability and new business models, which consists of project topics that discuss how to create sustainable and concrete solutions to circular economy. Second theme is leadership and future concepts, under this are topics that border on leadership and business continuity with relevance to the future. Third theme is technology and material research and projects under this highlight technology usability and internet of things (IoT) as solutions to circular economy or how to develop circular economy production processes. The fourth theme is waste management, containing projects that discuss for example visualization of waste sorting and value chains. The analysis and categorization shows that these student projects distributes quite evenly under the categories but sustainability and new business models is a topic with least studies done so far.

3 RESEARCH DESIGN

In this chapter the frame of reference for the study is introduced as well as the service design process, containing all selected tools, methods and a timeline for the research.

3.1 Frame of reference

The framework of the research is presented in Figure 2. Circular economy sets the global level for the study and on national level, Topinpuisto is an actor in a circular economy field and operates as a circular economy hub. Topinpuisto wishes to engage and include various stakeholders, such as companies, partners, institutions and national organizations, in its work. At the core of this participatory action is a learning environment, through which various assignments, projects and internships are transmitted. Topinpuisto internal processes and a learning platform form the core of the learning environment. The aim of this study is to develop the learning environment and that work is done with service design methods and tools. The study also has an approach to online platforms as one goal is to improve the learning platform. Results of this research are an enhanced learning platform and process improvement proposals for Topinpuisto, which together will contribute to a stronger learning environment.

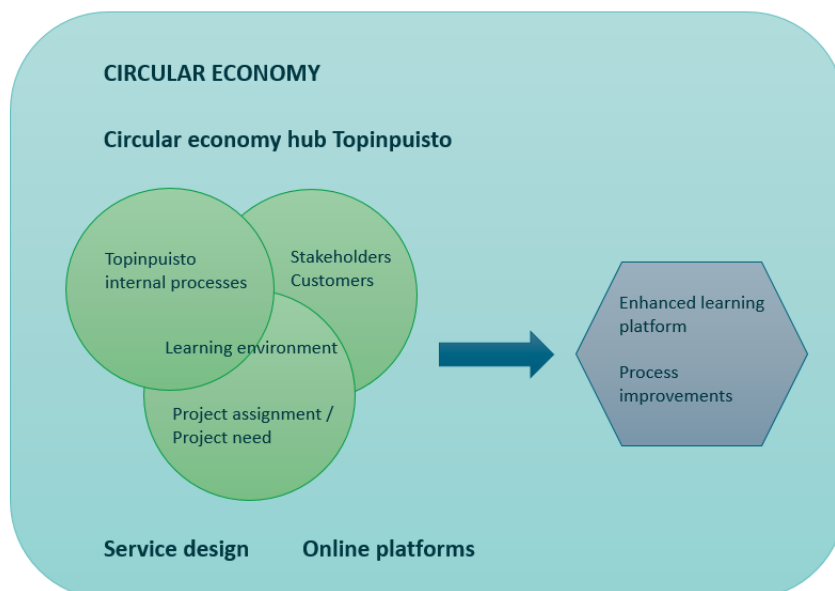


Figure 2. Frame of reference.

3.2 Service design process and research methods

For the process of improving the learning platform, that is, identifying challenges and opportunities as well as developing and delivering solutions, the double diamond model is chosen. It is a model, which helps in understanding and defining problems as well as iterating and delivering solutions to them (Design Council 2020). The double diamond for the project is presented in Figure 3 and it visualizes different tools and methods used in each phase of the design process as well as the timeline of the project. The research project started in February 2020 and continued until September 2020.

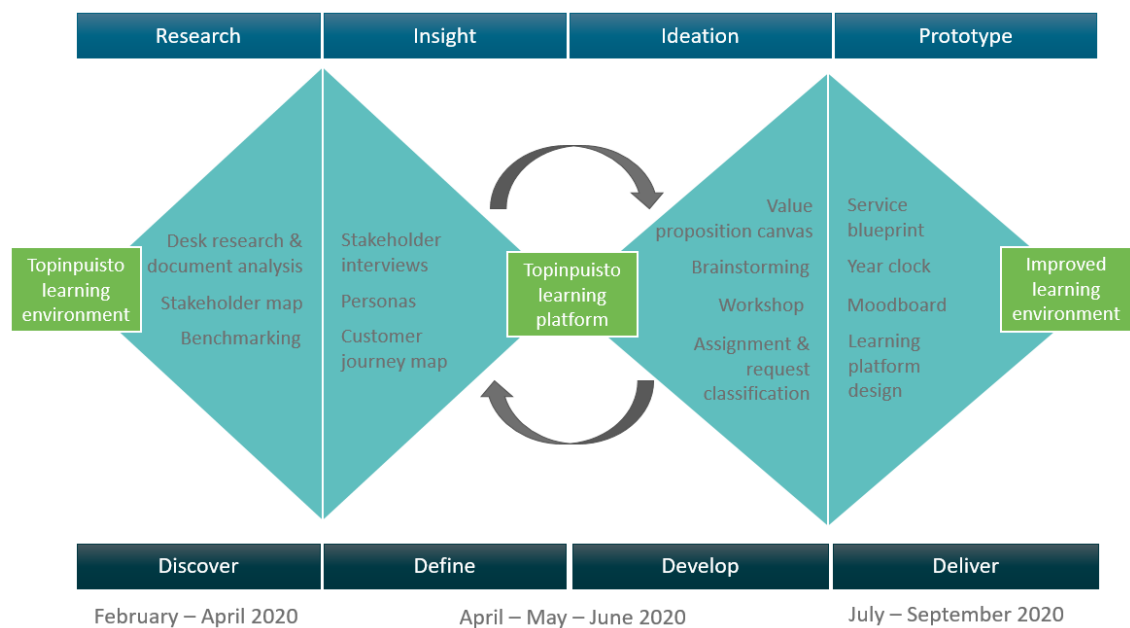


Figure 3. Service design process.

The research phase starts with a desk research and document analysis, in order to get a broad overview of the current status and processes. This contains literature review of theoretical publications, articles and researches that examines broadly circular economy, learning platforms or importance of student projects in circular economy. In addition, the phase contains identification of stakeholders and creation of stakeholder map in order to gain understanding of the service environment and key stakeholders. Benchmarking learning platforms of educational institutions as well as other actors in the circular economy field is also done in order to compare and gather best practices from others. Goal of the research phase is both to discover essentials of the Topinpuisto learning environment and to understand how other organizations are building similar services.

The insight phase contains interviews of key stakeholders and construction of personas and customer journey maps. Goal of the insight phase is to understand who the service users are as well as to gather user experiences and to understand the needs and expectations of the service users. In the ideation phase the process continues with building ideas about the learning environment. Ideas are gathered with several tools and methods, such as value proposition canvas, brainstorming and workshop with stakeholders. Goal of the ideation phase is to develop the learning platform and ideate solutions that can be used in building the prototypes.

The prototype phase is about designing new solutions for Topinpuisto organization and the learning platform. Organizational improvements are prototyped with a service blueprint and building a year clock for Topinpuisto organization. Designing the learning platform is done by building a visual, digital prototype of the learning platform; first with a moodboard and then with an actual wireframe for the platform. Goal of the prototype phase is to deliver improvements to the Topinpuisto learning environment that concern both the organizational back-end processes and the learning platform.

4 CIRCULAR ECONOMY AND LEARNING ENVIRONMENTS

Meeting the needs of future generations' centers in the radical way in which current users transform natural resources (Preston et. al. 2019). In achieving such sustainable growth pathway, it is essential that primary resources are used efficiently and at the same time replaced substantially with secondary resources. Circular economy is an innovative approach at achieving economic efficiency through maximum use of resources and reduction of wastes. It is essentially designed for business, society and the environment. Circular economy thrives on efficient use of materials already used in production, which no longer seem to have value but can be innovatively reshaped into a new product. According to Stahel and Clift (2016), circular economy is an economic system that eliminates waste to boost continual use of resources, reuse and recycling. Economists agree that circular economy assumes zero-tolerance for resource wastage. Observations recorded are that circular economy is in contrast to the traditional production system in which waste materials are discarded (Stahel 2016).

Topinpuisto operates in the field of circular economy and thus the theoretical approach also contains a strong focus to the circular economy. This chapter will first introduce circular economy and then present the key elements and structures, going through the global, regional and local levels of circular economy. Furthermore the chapter discusses importance of universities as a driving force for circular economy and goes through main characteristics of online platforms and learning environments. Lastly, future of circular economy is also discussed. The aim of the theoretical background is to provide an aspect to the key elements of circular economy as well as to key elements of learning environments or online platforms. These will help the researchers to evaluate, which elements would be essential to adopt also to the Topinpuisto learning environment and how it could reflect the core concepts of circular economy. In addition, the conversation about the importance of universities and students as driving forces for circular economy can be reflected to the importance of the Topinpuisto learning environment and how university cooperation could be improved and strengthened.

4.1 Introduction

There appears to be no standard definition universally acknowledged for circular economy. The elements observed in circular economy have featured loosely in production or industrial management process, and are centered on efficient use of resources, recycling, reuse and waste management. Modern pressure on use of resources, degree of scarcity and the need for sustainability as well as improvement in the environment have all compelled thoughts on a new strategy. This strategy is immersed in the articulation of circular economy as a system in which the elements of recycling, reuse and waste management are innovatively crafted into sustainable new areas of economic activities.

Circular economy seems to be growing rapidly because of transition by companies and nations to the adoption of its process. Ellen MacArthur Foundation's Circular Economy 100 is a platform that unites organizations across sectors with commitment to collaborate on a circular economic model (Ellen MacArthur Foundation 2016a). The objective is to employ resources by innovative design that promotes prevention, product reuse and material recycling. The entrepreneurial feature of circular economy is the drive to design solutions in response to gaps or human needs in society. In simple terms, circular economy is a system in which activities support the creation of more value and less waste of resources (Sormunen & Tiilikainen 2017). In essence, used resources, left as waste can still be channeled to the creation of another product. In a circular economic system, there is no room for waste. Every item is an input factor that has value to add in a new chain of production or service delivery. Circular economy is therefore a paradigm shift from the traditional linear economy that promotes use and disposal of waste. The new paradigm is skewed towards both consumption reduction of raw materials as well as reduction in environmental impacts of both consumption and production. (Sormunen & Tiilikainen 2017).

Circular economy is the transformation of the existing sectors and sub-sectors into a hub such that no waste goes by unused. However, where waste is inevitable, it is innovatively recycled or turned into a new product that is designed to fill a gap or meet a society need. Circular economy is technically a system that is characterized by efficient and affordable high quality recycling, reuse, repair, design and re-design of products (European Union 2020). It is also intended to initiate the emergence of a range of new, but sustainable services. Circular economy thus throws up the challenge of creativity, innovation,

application of critical knowledge and appropriate skills. Nevertheless, it has implications for the generation of better quality of life and fresh jobs. (Preston et. al. 2019; European Union 2020.)

From the economic perspective, circular economy is described as the operation of a regenerative growth model that balances consumption while maximizing the rate of use of materials without causing environmental harm (Silpa et. al. 2018). The view of circular economy can be further captured as total maximization of resources and less dependence on primary materials. This is the driving force that propels the initiative for circular economy. It is however obvious that corporate business organizations have begun to leverage circular economy principles to increase profitability and productivity. The strength of circular economy lies in its burst of business creation, synergy and fresh entrepreneurial force among business-conscious individuals and organizations. Circular economy is multi-dimensional and technically complex but it is an integrated whole, allowing and promoting circularity, new trends of value chain management and a new regime of enhanced waste policy. In simple terms, circular economy is environment-friendly, thereby supporting world leaders' view of sustainable environment. (Ellen MacArthur Foundation 2013.)

One major challenge that has engaged the thought of circular economy is the observation that resources are finite and consumption pressure is higher. This prompts the need to conserve as well as recycle wastes or convert them into useable resources. A single organization cannot handle the challenge and technicalities of circular economy hence the need for a platform for collaboration. (European Union 2020). Considerably, concern over increase in the average global temperature and volume of waste generated from primary resources is the origin of thoughts for alternative actions. It therefore implies that attempts at adopting secondary resources for reuse or recycling in a more scientific manner dominate the drive towards circular economy (OECD 2018). This is the main concept of circular economy.

For a resilient economic growth, studies also show that circular economy offers a pathway to improved industrial development, job creation, circularity of international value chains and motivation for investment across continents (European Union 2020). While developed countries are currently in the forefront of transition to circular economy, developing countries are yet to accord it any significant attention. Nonetheless, as the United Nations and European Union pursue the sustainability of an inclusive circular economy, a global agenda that elicits partnership and collaboration is imperative

particularly to integrate the economies of developing nations. Indeed, a high level of partnership, support and collaboration is required from advanced economies, and the corporate industries to drive an all-inclusive circular economy. The European Union, United Nations, China, Japan and Finland have drawn innovative policies, procedures, plans and strategies among others in response to their motivation for transition to circular economy (Preston et. al. 2019).

4.2 Global processes

Circular economy can be adopted into the economy of any country in eight identified processes. Applying these processes would help to reduce the challenges related to exceeding the biosphere's regenerative capacity. These processes are categorized into recycling; efficient use of resources; utilisation of renewable energy sources; remanufacturing, refurbishment and re-use of products and components; product life extension; products as service; sharing platform models, and shift in consumption patterns. These processes are streamlined into three categories namely; using primary resource scarcely, maintaining the highest value of material and products as well as changing utilization patterns. (Vasileios Rizos et. al. 2017.) The Finnish Innovation Fund Sitra, categorised these business models into five categories; these are adopted in this theory and presented in this chapter. The categories are product as a service, renewability, sharing platforms, product life extension and resource efficiency and recycling. (Sitra 2019b.) Sitra is introduced more in detail in chapter 4.3.1 where the organization and its action in the circular economy field are presented.

Product as a service

Product as a service is an approach to enhance the sustainability performance of traditional product systems by selling the products as a service instead of owning. This is implemented through leasing or renting. In this model, customers only have access to the product while the company retains the ownership. This practice can bring environmental benefits as the model motivates the company to repair and maintain the product in use for a longer period of time. (Vasileios Rizos et. al. 2017.) Having products as a service has even become easier with internet of things (IoT), their ability to collect and communicate usage data to other objects or systems they are affiliated with. Take

for instance the 'Uberization' phenomenon, people nowadays, especially the new generation, do not really want to own a car as long as they are able to move easily with bicycles, scooters, and cars. It does not cost as much as buying or owning a car and yet the desired result is achieved. Another example worth mentioning is Philips' initiative to create Light as a Service offering with LED lights. LED stands for Light-Emitting Diode, an electronic device that emits light when an electrical current is passed through it (Techterms 2009). LED lamps are energy efficient; reduce lighting energy consumption up to 80% thereby saving energy costs and reducing carbon footprint (Philips 2017). Shifting away from owning products has numerous advantages: Product as a service creates newer and more personalized experiences for its users, it is cost effective and predictable, it also gives room for customer to be picky, which has put pressure on manufacturers and service providers to provide quality services. For the manufacturers and service providers, they have recurring revenues that are generated over the product's lifespan. (Aubertin 2019.)

Renewability

Renewable materials are those materials with biomass composition and are continually replenished, such as, wood, crops, marine products or organic waste. Renewable materials are easy to reuse, remanufacture and recycle thereby decarbonising the economy. One of the great potentials of recycling renewable materials is its capability to replace finite and fossil-based materials. (Ellen MacArthur Foundation 2018.) For example, the use of wood in many manufacturing applications and after-use cascades, large volumes of paper and cardboard recycling, and the potential for the use of plant-based or greenhouse gas feed stocks for bioplastics entering recycling streams. (Ellen MacArthur Foundation 2018.) Tork Paper Circle is the first recycling service for paper hand towels; the company collects used paper towels and recycles them into new tissue products. They collect 2 million tons of hand towels, recycle them and at the same time facilitate good hand hygiene globally. Tork Company applied special treatment in the recycling process and were able to close the loop for the products. A life cycle assessment shows that the new recycling service from Tork reduces the carbon footprint by at least 40 percent compared to current waste handling options. (Ellen MacArthur Foundation 2018.)

Responsible sourcing of all renewable materials is dependent on respecting the regeneration levels of all resources and healthy ecosystems on land and in the sea. For example, forestry and agricultural biomass for land and marine biomass or side-stream waste for sea. These products should be reused and recycled until they are safely returned to the biosphere. (Ellen MacArthur Foundation 2018.) The society is still lagging when considering the extent of awareness of usefulness of renewable materials. Public and private sectors need awareness on what constitutes renewable materials and its usage. This is in terms of an industrial symbiosis where sectors look across value chains and use the side streams of production from other sectors. It can also entail the fostering of collaboration among different industries to discover how waste from one process is used as raw material in another industry. (Vasileios Rizos et. al. 2017.)

Sharing platform

Aside using product as a service, sharing platform is another model that helps to keep product in circulation for a longer period. Sharing reduces the number of products and materials that is needed and reduce waste that is generated, although there is an increase on the impacts from the use phase of products. (Mieras 2016.) Sharing models have been used in car-sharing and accommodation services and are facilitated by advances in digital technology because they are often implemented through social platforms. A lot is already happening in Finland with Suomi 2.0., a platform economy sector in which companies or individuals can create services to add value. Other examples are the Airbnb, a platform that enables people rent out their homes, and Uber that allows car owners offer rides to other people. Furthermore, there is also bicycle and scooter sharing hosted in social platforms. (Mieras 2016, Sitra 2019c.)

Product life extension

Product life extension refer to products and components that are designed with the objective of having a long-term durability and long life spans. One way of extending product life is through proper care and repair, which reduces the need for people to buy more. This act helps the society to avoid CO2 emissions, waste output and water usage. (Mieras 2016.) The effort is geared towards optimizing product lifespan rather than maximising it. When products have the longest possible lifespan, it means more

resources are used in building such products. If a product's lifetime is then longer than the user would use it, the extra resources are considered as waste. Although there has been debates about introducing planned obsolescence into product manufacturing in tacking product optimization and product maximization. Introducing planned obsolescence would mean designing a product with an artificially limited useful life, so that it becomes obsolete at some point. If that would be considered as going against the concept of product life extension is another issue entirely. For instance, tools such as drills do not need to function for 25 continuous years, as an average repairperson might need it for; neither should fabric of a baby towel last until the child is ten years old. (Mieras 2016.)

Resource efficiency and recycling

The European Commission's Flagship initiative for a resource-efficient Europe can be traced to the 2011 flagship communication. It has been a continuous initiative since then. It focuses on a wide range of resources that are renewable and non-renewable resources as well as ecosystem functions and services. They include raw materials such as fuels, minerals and metals, as well as food, soil, water, air, biomass, biodiversity and ecosystems. The ultimate policy goal is to produce more value with less input, use resources in a sustainable way and manage them more efficiently throughout their life cycle. (European Union 2020.) One of the focus areas of European Union regarding resource efficiency and recycling has been on three interlinked priorities: Smart growth that has to do with developing an economy based on knowledge and innovation; sustainable growth, promoting a more efficient, greener and more competitive economy as well as inclusive growth, fostering a high-employment economy delivering social and territorial cohesion. (European Commission 2020.) Resource efficiency and recycling business model is Sitra's one of circular economy model that has a lot in common with Topinpuisto, this model demonstrates the importance of maximum usage of earth's resources in a manner that waste is drastically reduced while at the same time converting the waste to usable products either directly or forming manufacturing materials.

4.2.1 United Nations and European Union

The highest political institutions in the world have not stopped worrying about achieving the sustainability of the planet. The United Nations (UN) approved eight Millennium Development Goals in 2000 and, fifteen years later, the European Union Action Plan for the Circular Economy, the 2030 Agenda for Sustainable Development, was also approved. This is an indication that there is a need to seek a transition towards a less linear economy, in which, products, materials and resources are kept in the system for as long as possible and generation of waste is minimized. (Moric et. al. 2020.) Moreover, the net benefit of circular economy has been estimated up to 1800 billion euros by 2030 with its significant environmental and social benefits (Curtis & Mont 2020). The European Union (EU) on its part recognizes the core significance of sustainable development. This is not surprising as EU member-states are also members of the UN and therefore, they are signatories to UN conventions, charter and agenda. The European Commission has put in place measures to migrate to full national and regional circular economy. It has initiated a process for the integration of a stronger sustainability. The European Commission proposed a global circular economy alliance with a view to identifying gaps and promoting global circular economy. It equally set out the initiative for partnership with major economies outside Europe in pursuit of the circular economy agenda. (European commission 2020.)

The EU is currently economically and politically committed to transition to circular economy, having observed through research the potential benefits of circular economy and its potential to strengthen the current industrial base of EU member-states. Consequently, the EU has developed a circular economy plan that enumerates characteristically the agenda, gains and management of a circular economy. The body is committed to leading and supporting the efforts at establishing a circular economy and implementation of the 2030 Sustainable Development Goals. (European Union 2020.) A careful examination of the EU's proposal for integrated circular economy in Europe reveals a highlight of value chains, sustainable product policy framework, measures to make circularity effective, monitoring of action progress and engagement of all stakeholders, including European citizens. Largely, the drive towards full circular economy in Europe is still at the proposal stage. However, effective collaboration is being sought from corporate stakeholders and individual national economies. In all, circular economy has become a critical feature of EU's 2050 strategy in pursuit of a neutral

climate in Europe. The circular economy has gained increasing prominence as a tool that presents solutions to some of the world's most pressing crosscutting sustainable development challenges. It has been widely recognized that switching from the linear model of economy to a circular one brings environmental, social and financial benefits. (Lewandowski 2016.)

4.3 Circular economy in Finland

Finland is particularly reputed to have been in the forefront of transition to circular economy. The government of Finland has shown political will and strong commitment for a sustainable circular economy. Its efforts through public agencies have revealed a level of success. However, the transition to circular economy has assumed a gradual approach. Efforts of the government and its agencies are undergoing an experimental process. It is nonetheless notable that Finland has made a comprehensive road map, thus setting a significant landmark for transition to circular economy. Among efforts surveyed, Finland appears to have gone ahead of many nations, considering its array of policies, projects and strategies directed at experimenting with circular economy and ultimate migration to that level. (Sormunen & Tiilikainen 2017.)

4.3.1 Sitra: Finland's main organ for circular economy

Finland's national ambition to migrate to a circular economy is articulated in a circular economy strategy framed for the period 2016-2025. Practical translation of the agenda is the responsibility of Sitra, an organization that has been responsible for conducting circular economy experiments. The agenda for the realization of a circular economy highlights actions and best practices that can be adopted in all sectors of the economy. A critical element in Sitra's efforts is coordination, which is necessary in all efforts at realizing a circular economy. In order to achieve its target, Sitra has organized training and study sessions as fora for gathering data and relevant information. (Sitra 2019a.)

Sitra is the Finnish Innovation Fund, founded in 1967. Its overall goal is to drive and help in achieving a sustainable future for Finland. This is in consonance with the United Nation's 17 Sustainable Development Goals. Sitra is by extension an investment agency to the extent that it funds entrepreneurship ideas. The agency is known to stimulate businesses that have the potential to sustain the wellbeing of the Finnish people. Part of

its activities includes conducting research to assess social change and its impact on the Finnish environment. (Sitra 2013.) Essentially, Sitra promotes economic growth through its activities. It also offers partnership for research in circular economy with the objective of facilitating migration to a circular economy. One major attraction of the agency is its capacity to elicit convergence of professionals and stakeholders from different sectors of the Finnish economy. Nevertheless, the core of Sitra's mandate is creating a hub whereby different stakeholders collaborate towards Finland's transition to circular economy. Ultimately, the goal of Sitra is to generate and support wellbeing sustainability for the average Finnish citizen. Considering its promotion of partnership for activities that meet people's needs, Sitra tends to be the basic tool for circular economy transition in Finland. (Sitra 2020.)

In 2016, Finland broke the record by being a first country in the world to establish a strategy for circular economy. The work was facilitated by Sitra and prepared in co-operation with all relevant ministries, the business sector and other key stakeholders. (Sitra 2016.) The first step taken towards achieving actionable projects was to identify the areas that Finland is considered to be the strongest. The focus areas comprise environmentally friendly practices that encompass forest-based loops, transport and logistics, technical loops as well as common action involving legislators, companies, universities and research institutes, consumers and citizens and regions in order to achieve systemic change. (Sitra 2016.) A hired consultant company that had the responsibility of gathering useful information from various sectors drew a road map, although with close relationship with the key ministries: the Ministry of Economic Affairs and Employment, the Ministry of the Environment and the Ministry of Agriculture and Forestry were all involved. Several Finns were invited to bring the pilot ideas to the table. At the end of it all, Sitra used the accumulated materials to strengthen its thought on the five areas Finland is considered strong and introduced six key topics to ensure sustainability. (Sitra 2017.) Different projects were introduced around key topics and the projects covered variety of areas, such as creation of sustainable regional food system, processing of electric and electronic devices, ensuring emission reduction, turning forest industry by-products into transport fuels and chemicals, sustainable utilization of arctic natural resources as well as introducing a world circular economy forum. (Sitra 2017.) The World Circular Economy Forum (WCEF) 2020 was looking into how circular economy can build resilience in the economy and why it is necessary (Sitra, WCEF 2020). The idea is to incorporate these projects into Finland's circular economy process that rests strongly on the strengths of the country. (Sitra 2017.)

Apart from Sitra, the Finnish Environment Institute is charged with the responsibility of promoting and assessing the sustainability of circular economy in Finland. It has been engaged in surveying the environment, studying opportunities, challenges and devising methods suitable for transition to circular economy. Like Sitra, the institute is engaged in research projects, networks of collaboration and gathering of information to support and drive the feasibility of transition to a sustainable circular economy. (SYKE 2018.)

Circular economy business models for sustainable growth: an overview of Sitra's projects

Sitra is set to make Finland's economy one of the best in the world by the year 2030, an economy that could have a benefit of several billions of euros per year. How this will be possible is the continuous propagation of circular economy in the country. Sitra's work on circular economy began in 2014 and since then it has been developing areas where Finland is considered strongest; the use of forest, food production, industry, transport and administration. (Sitra 2017.)

Most of the value creation for companies is projected to come from the circular economy business model discussed in global circular economy processes. Specifically, Sitra is interested in five business models and according to them, these constitute the general circular economy business models: "product as service: providing services instead of products. Renewability: using renewable and recyclable materials as well as renewable energy in product design and manufacturing. Sharing platform: maximizing the usage of goods and resources and extending their life cycles by using digital platforms for renting, selling, sharing and reuse. Extending the product life cycle: using products according to their original purpose for as long as possible or enabling multiple instances of reuse through means such as maintenance, repair and refurbishment. And last, resource efficiency and recycling: material and energy-efficient solutions, the collection and reuse of products and raw materials that have reached end of their life cycle." (Sitra 2017.)

Sitra in collaboration with other organizations seek out sustainable well-being for Finland by building business models that revolve around circular economy. Sitra's list of more than 120 companies, which are into circular economy, revealed different organizations activities towards circular economy. Figure 4 presents some of the companies that have made it to Sitra's list. These companies are already maximizing products performance

and customer value during their life cycle rather than concentrating on reducing production cost. Examples are categorised based on the business model.



Figure 4. Circular economy business examples in Finland collected by Sitra (Sitra 2019c).

4.3.2 Circular economy and waste management in Turku

The waste policy in Finland is directed towards promoting sustainability in the use of natural resources in a manner that would not endanger human health or harm the environment. The Ministry of the Environment is responsible for writing the waste policies as well as at the same time monitoring its implementation across board. (Ministry of the environment 2018). Although the ministry directly oversees national waste, the regional parastatals steer the objectives of various municipalities at the local level. These municipalities delegate the responsibility to suitable companies. Lounais-Suomen Jätehuolto (LSJH) is directly in charge of waste management in southwest Finland. The company is responsible for organizing waste and offering waste disposal advice to residents in 17 municipalities. LSJH has operated since 2015 with Turku and Salo being their biggest owners. There are four waste treatment centers and eight sorting stations, which have exhaustive waste reception services. Before the birth of LSJH, Rouskis and Turun Seudun Jätehuolto were the two principal companies managing waste at the

region. However, as operating cost and complex waste management practices became evident, the two companies pooled resources together and formed Lounais-Suomen Jätehuolto. The aim was to provide high-quality waste management services with a focus on circular economy innovations. Waste treatment and service fees fund the provided waste management services. (Circular Turku 2017.)

LSJH has been active in supporting circular economy businesses, innovative development, including developing high value recycling and raising awareness on sustainable consumption. In 2015, Topinpuisto was created in Topinoja, one of LSJH's waste treatment centers. Topinpuisto was responsible for developing innovations and business solutions based on circular economy. The company was to support companies' circular effort in the areas of waste material handling and seamless collaborations among companies and local universities. (Turku.fi 2019.) LSJH together with Topinpuisto has done several projects in collaboration with various companies and Turku University of Applied Sciences, and this has yielded many positive results. The Telaketju and 6Aika (Circular economy hubs for the future) projects are worthy of examples. The Telaketju (textile recycling, sorting and utilizing network) project aims to improve material efficiency and extend the life of textiles, as well as the recycling business. The first phase of Telaketju project started in April 2017 and ended in January 2019 while the second phase of Telaketju started in May 2019 and is scheduled to end by April 2021. The success of these projects would gradually put an end to the uncontrollable exports of used clothes to the third world countries. (Telaketju 2020.)

LSJH with Topinpuisto desire to provide enabling environment for companies and universities to interact on circular economy matters. Topinpuisto in cooperation with Turku University of Applied Sciences is developing a material library to map materials flowing through the treatment centers. (Circular Turku 2017.) These materials would serve as guidance to companies on product design from the perspective of circular economy. Currently, the Turku University of Applied Science' circular economy 2.0 is a platform that encourages carrying out experiments and co-creation between companies and students. (Circular Turku 2017; TUAS 2020.) In the same vain, Topinpuisto learning environment platform is yet another forum for circular economy actors to interact, experiment and share ideas.

4.4 Universities as driving force for circular economy implementation

Successful implementation of circular economy models borders on achieving two primary targets. One of these targets is to introduce circular economy into the education curriculum early; this will help to cultivate professional talents. The second target is to ensure that society is well informed and is aware of circular economy. The second is easily achievable once the young adults in schools are familiar with the concept. (Qu & Shevchenko 2019). In Finland, several collaborations have been ongoing towards implementing circular economy principles in the education sector. The circular economy teaching for all levels of education project organised by Sitra in 2017 to 2019 is one of such collaborations. Over 70,000 students and young adults studied circular economy during this period. Sitra cooperated with over 50 schools, universities, educational organisations and companies. They build competencies with the requisite knowledge to pilot sustainable business practices. (Sitra 2019d.)

Training of future experts comes with its own challenges where the method of teaching and materials needed are not sufficient. Natural sciences and mathematics are critical domains needed in circular economy field in Finland as expertise in these areas is weakening among the Finns. Other challenge is the declining interest of young adults in saving the earth and believing in their own capabilities. For example, refining technology is an important field for circular economy but the field is not chosen by students when they select their field of expertise at university. (Sitra 2018.) Teachers are required to intensify new innovations in teaching, their role does not stop at providing information, but they are expected to be facilitators or enablers who help to guide students into the right direction. One of the keys is being deliberate in introducing circular economy into course contents and ensuring practical regular collaborations between students and circular economy hubs. (Heikkilä et. al. 2018.)

University circular economy education should not be directed towards theoretical education alone but introducing practical innovative activities to meet the needs of circular economy implementation. The concept presented in Figure 5, depicts the synergies that must be operational in realising the successful implementation of circular economy model in universities and how students are in the centre of implementing circular economy furthermore to community residents and to the public (Qu & Shevchenko 2019).

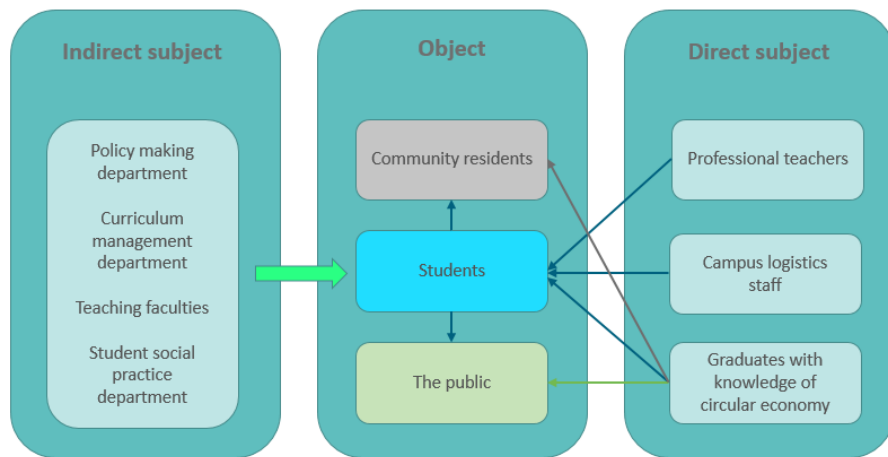


Figure 5. Subjects and objects in implementing University Circular Economy Education (UCEE) (Qu & Shevchenko 2019).

The indirect subjects are those elements that are necessary to support successful implementation. They are directed at community residents to ensure that there is awareness about circular economy and its advantage is in ensuring community's sustainability now and in the future. Curriculum management department and teaching faculties are to ensure that course contents incorporate the principles of circular economy and there are practical ways of making circular economy visible to students, for example collaborating with circular economy hubs. Teachers must be ready to update regularly academically to ensure that they stay abreast of current issues, as it is unfolding in circular economy. Campus logistics staff needs to give support for enabling easy access to knowledge or being as examples. For example school library should be updated with current books, and both canteen and public places in the school must support circular economy attitude. Consequently, universities can produce professionals and talents for circular economy implementation in the society. (Qu & Shevchenko 2019.)

4.5 Online learning environments and digital platforms

Online learning environments define distance learning and transmission of knowledge through the Web. For users, they offer possibility to access training material and develop themselves regardless of location or time of day. The systems use multimedia technology and the learning characteristics of new media, such as interactivity, dynamicity and personalization of training paths. (Ballarano et. al. 2016, 36.) Learning environments have changed during the past ten years and instead of being only

platforms to store the training material, the current systems highlight the importance of collaboration. Change of learning environments has followed the general development where users have become active characters in the use of World Wide Web, where they do not only receive information, but also create and share contents. Thus learning environments have been transformed and nowadays they are collaborative learning systems supported by the computer, where the knowledge is socially built. Key words for the systems are participation, sharing, collaboration and interactivity. Building knowledge socially means that the users create new knowledge and content to share it online. This for one's part means that the learning object is continuously fragmented and rebuilt due to the collective and collaborative elaboration with new participative technologies in a highly social and interactive environment. (Ballarano et. al. 2016, 36.) Thomas (2010, 505) also states, that there has been a shift from learning management systems to social spaces. With this change, the pedagogical approaches have also changed to highlight communication and collaboration. Digital learning hubs demonstrate innovative pedagogies and a learning approach that is mutual collaborative process, with sharing both expertise and collective experiences. (Kurcikova & Littleton 2015, 8.)

For businesses, online platforms are ideal environments to use for creation or ideation of processes or collecting information because they involve both people and information technology in value creation. These platforms may differ in terms of users or purpose, but they all share a number of common characteristics, such as inclusion of multiple users and use of ICT technologies in creation and collection of knowledge. Use of information technology enables more efficient operational capabilities due to efficient information exchange, storage and processing. Through collaboration and participation of people in internet, it is possible to achieve common goals or goals that would be difficult for the organization to achieve alone. The drawbacks related to online platforms are for example lack of direct contacts between people, which creates challenges in organizing co-creation or ideation between different actors. (Maciuliene & Skarzauskiene 2016, 4827-4829.) When considering the usage of an online learning platform there are certain elements that a company should pay attention. First, it is important to define the customer segments and to whom the platform is offered. Second, the company should think how they create value for their customers or partners and how they communicate with them. Third, the key activities of the platform needs to be considered so that value is created for customers. Fourth, key resources of the organization needs to be planned to support expert knowledge, participation in operational processes or building the brand

for the platform. And fifth, cost structure should also be considered in order to recognize main fixed costs, content creation costs, marketing promotion activities or administrative costs related to management of the platform. (Cornejo-Velazquez et. al. 2020, 106–110.)

Essential elements of an online platform depend on the users or the purpose of the platform but there are some main characteristics that the platforms share. Content and functionalities management is an essential aspect for an implementation of these platforms. Platform design is important if it is the main communication channel towards certain customer segments. Usability and user experience, for their part, must be guaranteed by the front-end, while scalability and security are the responsibility of platform's back-end. (Ballarano et. al. 2016, 41; Cornejo-Velazques et. al. 2020, 109.) Typically online platforms are dynamic and open and they allow individuals to join and leave them freely (Maciuliene & Skarzauskiene 2016, 4827). As users of online platforms have become more equal, the platforms should not follow a traditional top-down approach, but assume all users as talkers who interact with each other and exchange cultures. Technological development has made it possible to realize collaborative learning and to have an efficient online conversation. (Ballarano et. al. 2016, 35.) Today's online platforms do not only use e-mail, chat or forum as communication channels but the most important tools are those that facilitate synchronous communication and are linked to social media tools. In practice, this means usage of wiki, blogs, podcasting, tagging, social networks, YouTube or Google with an aim to increase collaboration among the users. (Ballarano et. al. 2016, 41.) Thus, online platforms are imaginative places where users can cross-fertilize their ideas. There is no single pre-determined outcome and the winning idea can be any piece of work that is collaboratively agreed to be the best by the online community. (Korcikova & Littleton 2015, 5–6.)

4.6 Future of circular economy

Ellen MacArthur Foundation defined circular economy as “An economy that is restorative by design, and aims to keep products, components and materials at their highest utility and value, at all times” (Ellen MacArthur foundation 2015). This is an indication that the society's continuous existence depends on the ability to make provision for the future from activities of the past and the present. Historical evidence has suggested that a society that loses its connection with the past and its positive image of the future also loses its

capacity to deal with the problems in the present and can soon fall apart. (Weigend et. al. 2020.) The concept of circular economy operates in the “here and now” and sets a clear vision for a sustainable future. However, existing guidance and research into circular economy still shows lack of understanding of how to go from present to the future. (Lazarevic & Valve 2017.)

Suggestions are that future studies and methods is a preliminary model for circular economy to address the future thoroughly where visions that are created are acted upon systematically and pursued for sustenance. According to Ladu and Quitzow (2017) future studies has grown to prove its capacity to deepen our understanding of uncertainties. Studying the possible, probable and preferable futures with the inclusion of worldviews and myths would create a diverse set of future images that can better prepare the world on how the future may unfold (Inayatullah 2013). Climate change, that is the world’s biggest concern, and other world problems such as freshwater shortages, global warming, ocean depletion and pollution, land degradation, loss of biodiversity and greenhouse gas emission are moving ahead at a speed faster than the ability of humanity to solve them (Weigend et. al. 2020). It is possible to use the different methods of future study to navigate through the turbulent problems ahead and find alternatives to save the earth. One of such future studies methods is creation of scenarios to make visible possible events and activities of the future that can put the world into extinction. There are more than 378 definitions of scenario, but they all have the same elements of considering the future. It is also in order to argue that definition of scenario is unique to every scenarist in the field. The required content is critical thinking combined with innovations to bring to reality certain challenges and possibilities, thereby finding alternatives to them. (Spaniol & Rowland 2019.)

Studies have warned that the next hundred years could offer more prospects, challenges and threats than the past thousand years. These challenges range from the forces of climate change, population growth, loss of biodiversity, famine and poverty. All these challenges require radical strategic solutions and innovations from scientific and technological breakthroughs. However, more critical will be effective collaboration and active exchange of information among practitioners in academics, politics, religion, and business and other stakeholders, and clear communication of relevant issues and solutions to the general public. (Barnosky et. al. 2016.) Information available on the progress of circular economy integrations still shows that the world is not prepared for events that would unfold in very near future. As, at 2019, only 9% of world’s economy

and government are designed for circular economy (Viens 2019). Lisa McLean (2019), the chief executive officer of open cities and recent panelist at the launch of global infrastructure hub's infra challenge, stated that; "The world does not have enough virgin resources to support everyone who will be on the planet by 2050. The earth has exceeded its planetary boundaries and as a result, the rapid and significant destruction of our biosphere is going to impact on health and livelihood of all people. It will lead to collapse of fish stocks, water scarcity, soil erosion, air pollution, global deforestation, biodiversity loss and the list goes on."

The future predictions are clear about the dangers ahead unless all stakeholders act intentionally to reduce every form of degradation in all activities. Based on available information, amongst the various sustainability issues, researchers have identified three scenarios that are likely to occur in the future unless the society would intentionally adopt circular economy principles. These scenarios concern plastic disposal, E-waste disposal and usage of fossil fuel, and are presented in Figure 6.

Plastic disposal		
Problems: Collapse of fish stock; water scarcity; ocean depletion & pollution; soil pollution; global deforestation; biodiversity loss; health issues as a result of toxins from the disposed plastic	Resultant effects: Fishes bellies filled with plastic debris; Bisphenol A (BPA) may gather to liver, lungs and kidneys; Over 95% of plastic packaging is wasted yearly amounting to \$120 billion	Future of circular economy: The amount of plastic flowing into river can only be reduced by 7% in the next twenty years; Restore oceans health and generate savings of up to \$70 billion for governments by 2040; Increase humans health
E-waste disposal		
Problems: Energy waste; Nature conservation & restoration problem; Climatic change	Resultant effects: The annual volume of global e-waste could be up to 120 million tons annually by 2050; About \$62,5 billion is locked in the form of gold and platinum	Future of circular economy: Renewable energy from bioenergy; Increased power generation; Result into clean and carbon free electricity; Limitation of global warming to 1,5°C
Fossil fuel usage		
Problems: High concentration of CO ₂ in atmosphere; Imbalance of GHG emission; Land degradation	Resultant effects: Severe heat; Decline in tourism sector	Future of circular economy: Reduction of GHG emission by 25%; Create 700 000 new jobs

Figure 6. Three scenarios towards future of circular economy.

Ellen MacArthur foundation warned in 2016 that the ocean could contain plastics in weight more than the fishes by 2050 as over 85% of plastic packaging is still wasted. (Ellen MacArthur foundation 2016b). This could result into collapse of fish stock, water scarcity, ocean depletion & pollution, soil pollution, global deforestation, biodiversity loss,

plastic waste taken for prey, health issue because of toxins from the disposed plastic. (McLean 2019; Carrington 2020). However, the resultant effects of this uneconomical disposal of plastic waste into oceans could result into health problems. Research has shown that micro plastics and Nano plastics articles are now discoverable in humans' liver, lungs and kidney (Carrington 2020). More so, over 95% of plastic packaging is wasted yearly amounting to about \$120billion (Viens 2019). The danger lies in the time it takes for plastics to completely biodegrade, even after a hundred years, these plastics are not fully broken down. A study (Futuretimeline 2020) showed the amount of years it takes different plastics to completely break down in the ocean; this is shown in Figure 7. With circular economy in the future, amount of plastic flowing into the river can be reduced by 7% in the next twenty years. In addition, ocean health would be restored and generate savings of up to \$70 billion for governments by 2040. (Pewtrusts 2020.)

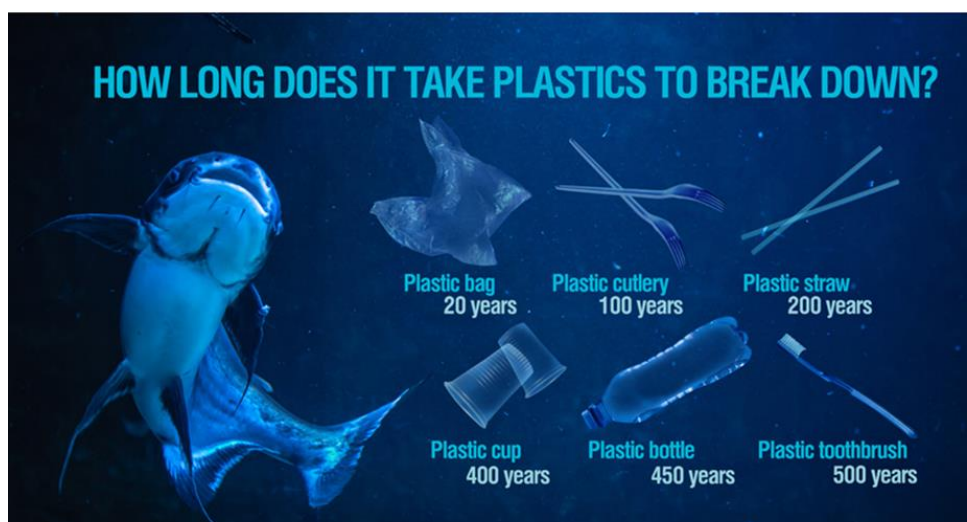


Figure 7. Break down of plastics in the ocean (Futuretimeline 2020).

E-waste is considered another issue that requires attention, some likely problems of e-waste disposal are energy waste, nature conservation and restoration problem, as well as climatic change. The resultant effects of this is the amount of e-waste that could rise up to 120 million tons annually in the next thirty years while converting to cash may be about \$62.5 billion, which are locked up in form of gold, platinum and other valuable materials. (Global recycling 2019.) However, the future of circular economy will for example see the possibility of using renewable energy, resulting into clean and carbon free electricity, electrification of vehicles and limitation of global warming to 1.5°C. (Smart energy transition 2017; IEA 2018; Smart & Clean 2020; Futuretimeline 2020).

The last issue considered was on fossil fuel usage, if the world would not retreat from use of fossil fuels and put more efforts in finding different sources of renewable energy, it might be subjecting itself to greater risk in the years ahead. Fossil fuel could generate serious problems of high concentration of Carbon dioxide (CO₂) in atmosphere, imbalance of greenhouse gas (GHG) emission and land degradation, this could result to severe heat and tourism could plunge if the environment is not conducive. (Smart energy transition 2017.) According to the report from Pewtrusts (2020), the future of circular economy could see a great deal of reduction of GHG emission by 25% and creation of about 700 000 new jobs (Pewtrusts 2020).

5 RESEARCH AND GATHERING INSIGHTS

This chapter presents the research process as well as tools and methods used to gather information and gain insights about the research topic. The research process was divided in two phases; preliminary research and gathering insights. Preliminary research focused on identifying the current service environment, stakeholders involved as well as researching best practices from other organizations. Insight phase concentrated on identifying the service users and the service journey as well as gathering their experiences, expectations and motivations towards the learning environment. Results of each research step are presented in the following chapters.

5.1 Preliminary research

Aim of preliminary research was to understand the environment where the Topinpuisto learning environment operates, get an overview of the existing situation as well as to learn more about the essential elements of learning platforms. Used research tools and methods were stakeholder map and benchmarking. These are presented in the following chapters with the research results.

5.1.1 Stakeholder map

Stakeholder map presents the various stakeholders involved in the service experience and their connection to each other. It also shows how stakeholders are connected to the service production and provide information what kind of impact they have on the customer experience. A stakeholder map helps to identify the most important people and organizations in an experience, it allows a visual understanding of different interplays among various stakeholders, which helps to make adjustment where needed. (Stickdorn et. al. 2018, 58-59.) Stakeholder map of Topinpuisto learning environment was done in order to map the different stakeholders related to the Topinpuisto learning environment as well as to get an overview, which stakeholders were essential to involve in the project. The stakeholder map for Topinpuisto learning environment is presented in Figure 8. It was done based on information received from Topinpuisto representative Johanna

Liipola and a stakeholder map representing all services of Topinpuisto. The stakeholder map for learning environment was reviewed with Johanna Liipola on 28.4.2020.

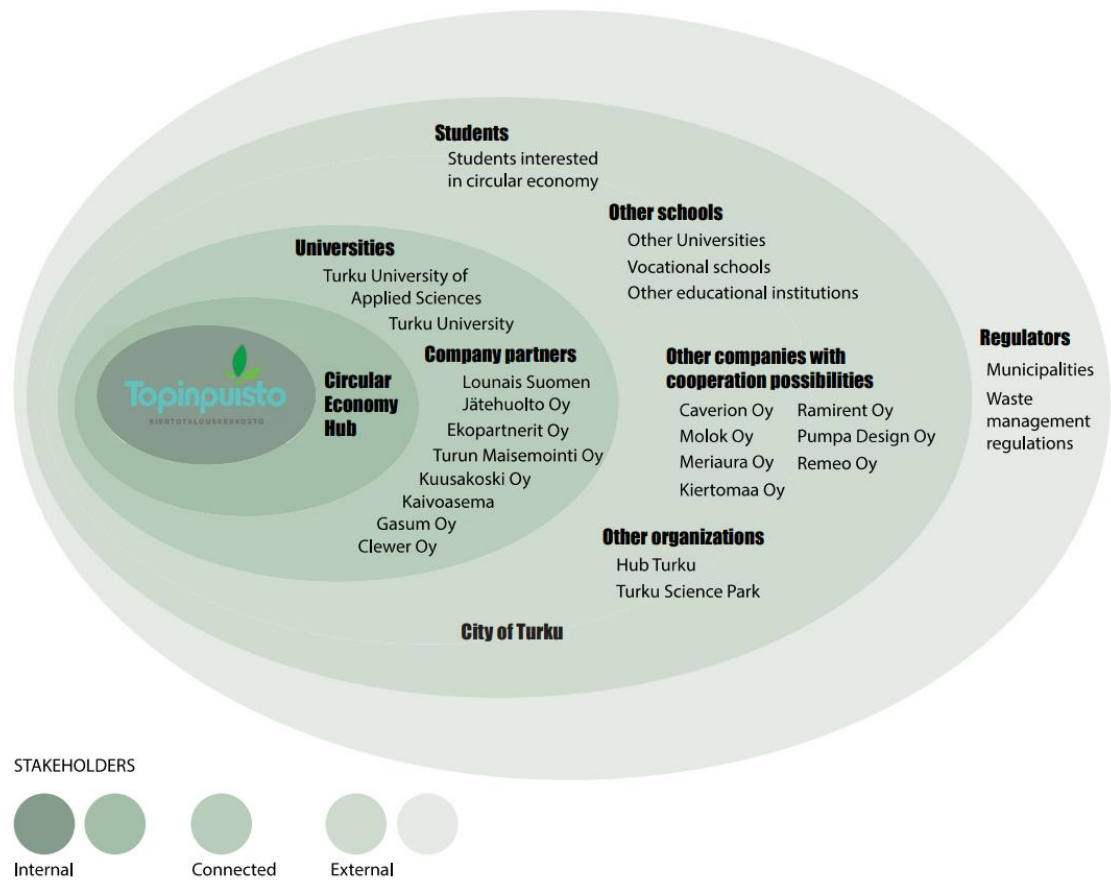


Figure 8. Stakeholder map of Topinpuisto learning environment.

Stakeholder map for the current Topinpuisto learning environment lists and divides different stakeholders into internal, connected and external stakeholders in order to show who they are and how they are connected. Topinpuisto is central as to what kind of services it is capable of rendering to its customers. Representatives of Topinpuisto are the internal stakeholders when it comes to assigning and placing different assignments with connected stakeholders. With the different projects and tasks, Topinpuisto serves as part of circular economy hub as an intermediary party, linking different companies and educational institutions together. Topinpuisto has the mandate to make information easily accessible to all stakeholders, starting from what projects are available, the estimated time of project completion and charges on the part of the companies if there would be any. Currently cooperation is mainly done with connected stakeholders, who are different companies and universities having established contacts

and activities with Topinpuisto, essentially showing the interdependency and collaboration that exist among these stakeholders. Turku University of Applied Sciences and Turku University are current main partners related to school projects. Company partners are key stakeholders in developing Topinpuisto, from which some already have taken part in the project cooperation with universities and some just have recognized the potential of it. This research focused on internal and connected stakeholders as these were the main parties having information and experience of the current processes and learning environment.

External stakeholders were recognized but currently they have not actively taken part in the learning environment and the process of agreeing different projects or assignments. For this reason students from different educational institutions, who are learning and wanting to become experts in the field of circular economy, were placed as external stakeholders and scoped out from the research. Other companies and educational institutions with interest and potential for learning environment cooperation, were also recognized. The companies presented in the stakeholder map, in most cases, are already cooperating with Topinpuisto but they are not engaged in the learning environment. Other external stakeholders are city of Turku, Hub Turku and Turku Science Park as they are engaged in cooperation with Topinpuisto and have potential for broadening the cooperation. For example, Hub Turku is a sub sector of Topinpuisto, where all circular economy network stakeholders can arrange meetings and discussions. Topinpuisto is also monitored by waste management regulations and they in turn guide clients as to the do's and don'ts of these regulations, and thus is included as part of circular economy stakeholders. Municipalities, for their part, also work as regulators.

5.1.2 Benchmarking

Benchmarking is the process of identifying, understanding and adapting practices from other organizations and it aims to help organizations to improve their performance. Benchmarking can be used to measure for example product offering, services and processes. (Tuominen 2016, 9–10.) The goal is to gain information and insight how other companies are organizing their services or processes, and then learn how organizations themselves could improve their own practices and apply these improvements. Benchmarking can also provide ability to respond to changing needs of customers by providing information what services competitors have. (Freytag & Hollensen 2001;

Tuominen 2016, 14.) Usually benchmarking is carried out within the same industry and in that case similarity of the competitive situation, business environment and market can ease the transfer of experience. However, benchmarking can also be conducted across industries and in that case it can provide inspiration to improve processes and adopt practices in the areas, which are easy to realize. (Freytag & Hollensen 2001, 29.) In this research, benchmarking was made to analyze how other organizations are organizing their learning platforms and what would be the best practices that could be learnt and adopted to the Topinpuisto learning platform. The following chapter presents the starting point for the benchmarking, the learning platform of Topinpuisto and after that, the benchmarking process and results.

Starting point – Topinpuisto learning platform

Starting point for the benchmarking was to look for the current Topinpuisto learning environment and it is presented in Figure 9. The current learning environment is part of the Topinpuisto internet page but it mainly consists of a short introduction and a contact form. The introduction is a written description about the engagement to different projects and possibilities. It states that “Topinpuisto arranges research and thesis projects for businesses, as well as trainees to engage with circular economy or resource efficiency” (Topinpuisto 2020c). However, the site does not have information about the purpose of the service or how to engage in cooperation between Topinpuisto, schools and the companies. It only presents that Topinpuisto strongly cooperates with the Turku University of Applied Sciences and there is a link to the school’s circular economy site.

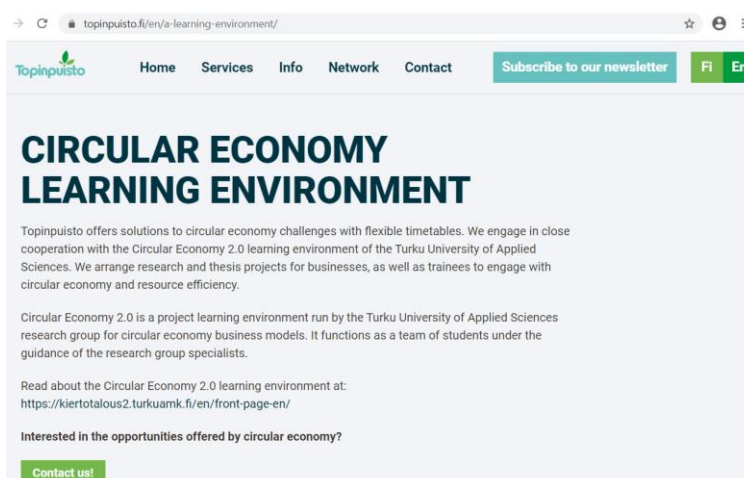
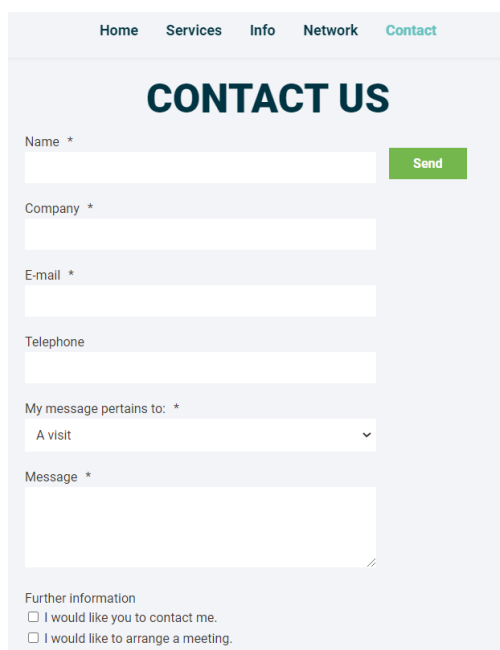


Figure 9. Learning environment frontpage (Topinpuisto 2020c).

Figure 10 presents the contact form available on the Topinpuisto site. The form contains fields for basic information, reason for the contact, message field and further information. Basic information contains name and company of the person as well as e-mail and telephone number. Purposes of the contact are divided in few categories and these are visit, circular economy network sparring, network or other reason. Message field is free text and the person can also decide if he wishes to be contacted and if he would like to arrange a meeting. The site does not provide any other contact information or possibility to contact persons directly.



The image shows a web form titled "CONTACT US" with a navigation menu at the top containing "Home", "Services", "Info", "Network", and "Contact". The form fields are: "Name *" with a green "Send" button, "Company *", "E-mail *", "Telephone", "My message pertains to: *" with a dropdown menu showing "A visit", "Message *", and "Further information" with two checkboxes: "I would like you to contact me." and "I would like to arrange a meeting."

Figure 10. Learning environment contact form (Topinpuisto 2020b).

These pictures demonstrate that companies are directed to fill a contact form or then be in contact with Turku University of Applied Sciences in case they have a need for project or a project in mind. There is no description what the cooperation can provide, how companies can benefit from it or what they can expect from the process. The site does not present any projects, which could work as reference cases. Thus, a current problem for Topinpuisto is that e-mails are sent back and forth in trying to assign projects between companies and schools.

Benchmarking of learning platforms

For the benchmarking, actors were selected both within the circular economy industry as well as outside the industry. The fields benchmarked were grouped in three categories: circular economy, students' matchmaking and educational institutions. Circular economy field contained five organizations from which two are educational institutions with a strong focus in circular economy or sustainability, one from Finland and one from the United States. Three of these organizations were circular economy actors or hubs, which all operate in the circular economy field and focus on creating new business options and possibilities. All these operate in Europe: one in Sweden, one in Germany and one in Denmark. The learning platforms within the industry were selected in order to see the practices and status of learning platforms within the industry. Student matchmaking and universities represent actors outside the circular economy industry. Two student matchmaking organizations were selected for the benchmarking, both from Finland. They were selected in order to look best practices for assignment matching and how to enable it. The goal of Topinpuisto is that assignments could be easily matched and thus student matchmaking companies were seen to provide examples for the assignment creation. Lastly, eleven learning platforms from educational institutions were selected for benchmarking. They all were Finnish universities and selected because they offer student cooperation projects and want to engage companies in different development projects and different ways of working, such as thesis, projects and internships. Thus, information provided on their internet sites works as a benchmark as Topinpuisto wants to engage both companies and educational institutions in cooperation with them. All in all, eighteen different organizations were selected and their internet sites, especially regarding to learning platform or company cooperation, were benchmarked for the research. List of these organizations is available in Appendix 1. The benchmarking was done during March and April 2020.

Benchmarking starts with the identification of the functions or areas to be benchmarked. The starting point for benchmarking is identification of subject areas within which improvements are critical. These areas should be strategic importance to the business and improvements in these areas will make a significant contribution to overall business results. In addition, while benchmarking, it should also be kept in mind what are the elements that customers perceive and value in the service or product in question. (Freytag & Hollensen 2001, 27.) With regards to the Topinpuisto learning platform, the

goal of benchmarking was to map what types of elements were most common in learning platforms and could be useful to adopt. These are presented in Figure 11.

Organization type	Sites benchmarked	Contact form	Contact persons	News section	Partners presented	Available projects	Done projects
Circular economy field	5	1	2	5	4	4	3
Student matchmaking	2	1	1	1	1	2	0
Educational institutions	11	5	11	8	5	2	5
Total	18	7	14	14	10	8	8

Figure 11. Summary of learning platform elements.

The basic elements of learning platforms were contact form or contact persons, news sections, partners as well as available and done projects. The results show that almost all had direct contact persons available and only half of the sites had a contact form. Regarding news section, majority of the sites had some kind of news section to publish news about the latest and upcoming events or to present their work. All actors in the circular economy field had a news section. Majority of the sites presented partners with whom they cooperate. However, on some sites, the information could be just logos of companies but not really presenting the cooperation and in some sites partners were referred to when publishing news about successful projects. Regarding projects, most of the companies presented available projects on their platforms. Logically both student matchmaking organizations presented available projects and so did four of the five circular economy actors. From Universities only two had available projects on their sites. However, this is partly explained by the fact that their available projects were linked to the student matchmaking platforms and presented there. Half of the organizations also presented done projects on their sites. However, it was noticeable that for the most part presented information was neither organized nor categorized but could be just small news, list of projects or thesis titles. The circular economy field organizations presented their work achievements more often than universities.

Besides benchmarking the basic elements from the platforms, other remarks were made. These remarks were made the customer in mind and focused on elements that would bring value to users of the learning platform. The information was grouped by advantages and disadvantages of learning platforms and is presented in Figure 12.

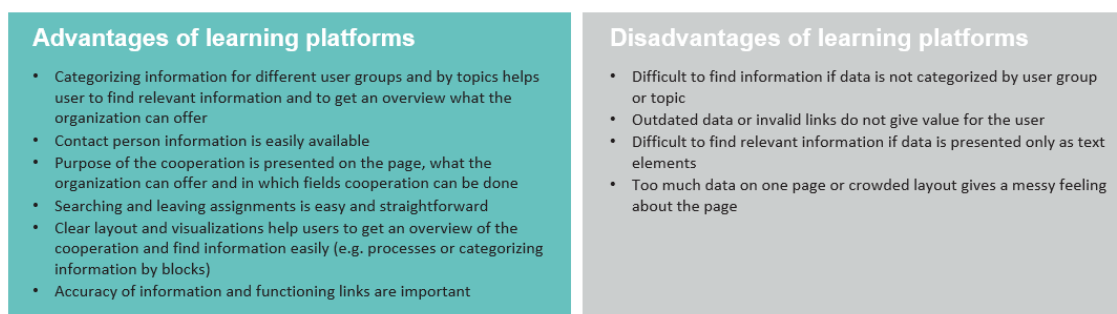


Figure 12. Pros and cons of learning platforms.

Several advantages concerning learning platforms were observed. One important aspect was that categorizing information for different user groups and by topics helped to find relevant information and to get an overview of the project types or cooperation possibilities offered by the organization. Categorization by user groups – companies, teachers or students – was not available on all sites and in those cases it was difficult to find relevant information. In general, categorization helped to understand the expectations towards companies and students. It was found useful if purpose of the platform and cooperation possibilities were presented on the site, describing what the organization was offering or in which fields' cooperation was possible and the ways of working. This information also could help companies to consider the input and time that they are able or willing to invest on the projects. Availability of contact information was emphasized here and the easiness of directing further questions regarding cooperation to corresponding persons.

Regarding assignment matching, it was noticed that it should be easy and convenient for the user. Function should serve both parties – the one leaving an assignment and the one looking for assignments. When creating assignments, it would be useful to have instructions available on the user interface. Visual look of the sites was an additional aspect, which was evaluated during benchmarking. Clear layout and visualizations helped to get an overview of the cooperation and to find information easily. On sites where information was presented for example in simple blocks categorizing information, it was easy to see with one glance what information was available. Furthermore, visualized processes were useful and gave an idea of the process just by looking at the picture. In addition, accuracy of information and functioning links were found important.

One of the disadvantages on learning platforms was organizing data and how difficult it was to find information if data was not categorized for different user groups or by topic.

From user perspective too much time was spent on trying to find relevant information from the site, such as contact persons or what kind of projects or assignments cooperation would offer. Another common problem on the sites was accuracy of information and inoperative links. In several pages, the sections presenting for example latest news, photos, events or projects, the information was either old or outdated, or the pages contained links, which did not function. This did not give much value to the user looking for information, neither did it provide information of the achievements or services of the organization. Categorization of information is important but it does not help if the information is outdated. For example pages contained information of past events in the upcoming event categories or old assignments were not removed from the sites. One positive exception to these were blog posts containing stories from students sharing their experiences from the projects. These contained quite recent postings and shared experiences were interesting for the reader. Regarding visual look of the sites, one common problem was that information was presented only as text elements and some of the sites were overloaded with information. If there was vast amount of information on the site, which was neither categorized nor visualized, it was difficult for the user to find relevant information. Thus, layout of the platform should not be too crowded or otherwise the general feeling of the site might be confusing.

5.2 Identifying service users and the service journey

Identifying service users and the service journey was done in order to gain an understanding who the service users are and what are their motivations, aspirations and pain points about the current cooperation with Topinpuisto as well as their expectations towards the learning platform. Information was gathered with interviewing Topinpuisto stakeholders and this information was then used to draft personas and customer journeys for the service. The following chapters present the chosen tools and methods as well as the research results.

5.2.1 Interviews of service users

In-depth interviews are a research method to gain information about particular expectations, experiences, services, operations, processes, and concerns, and about person's attitude, problems, needs or ideas. Interviews are usually conducted with

relevant stakeholders, for example with customers or employees. They can be held face-to-face, online or by telephone. Face-to-face interviews are recommended, as the interviewer is then able to observe the body language and behavior of the interviewee. They are often semi-structured, and it is advised to prepare the questions beforehand so that reliability and validity of questions can be ensured. (Stickdorn et. al. 2018, 120-121.) Interviews are used to identify the context, to know the user and to frame insights. The researcher collects stories and insights, sees the world from the user's point of view, listens to the user and understands relationship between people, product and context. (Curedale 2013, 128.)

For the research, the researchers interviewed company representatives and the aim was to find out the motivations of the representatives for the collaboration as well as the challenges and pain points experienced. Expectation was also to discover present difficulties encountered by users and to make suggestions as to what sorts of improvements would be needed or what kind of process would serve well the needs of the companies. Besides companies, university lecturers were also interviewed and with them, the focus was also to discover the motivations, expectations and experience from the cooperation as well as the pain points and concerns. Needs of the universities were expected to differ from companies and therefore it was seen important to gain insights from the lecturers concerning their motivations and needs from the cooperation.

Interviews were in-depth interviews, semi-structured and held online due to the social distance instruction from the Finnish Government as a preventive measure to limit spreading of coronavirus. Interviews were held between 21.4.-8.5.2020 and in total nine interviews were held: five company representatives and four university representatives. All interviewees represent organizations belonging to the connected stakeholders, having perspectives from the company – university cooperation and development projects. All interviews were performed by both researchers via Zoom online meeting tool, which is rather easy to use and reliable in functioning without technical difficulties. Only one of the interviewees experienced problems in logging into Zoom and that interview was conducted via Microsoft Teams. Length of an interview was approximately from 45 to 60 minutes. Interviews were conducted without video connection and thus it was not possible to observe the person answering questions but some observation and remarks were done from the person's voice, the way of talking and behaving online. All the interviewees appeared calm and relaxed and they answered all the questions. However, it was noticed that some of the interviewees had quite limited English

vocabulary and thus these persons could maybe have given more informative and versatile answers if their interviews would have been conducted in Finnish. Two interviews were held in Finnish, due to the request from the interviewees, and these were performed by the Finnish researcher. Furthermore, all interviews were recorded and interviewees were informed about the recording. Interviews were semi-structured, so questions were prepared in advance. List of interview questions can be found from Appendix 2. The basic interview structure contained five sections: background information from the interviewee; cooperation with Topinpuisto; user's main objectives and motivations; user's pain points concerning the cooperation and last; the learning platform, as to what is considered most suitable for such platform to be functional for them. Basic structure for the interviews was the same for company and university representatives but questions were slightly modified to target the user group and highlight issues from their perspective.

Data from interviews was organized and analyzed with the help of content analysis. Content analysis is a method to systematically transform a large amount of text into a highly organized and compact summary of key results. Transcribed interview texts are often common starting point for qualitative content analysis. In the process it is important to interpret the answers and to recognize main themes and categories but not to lose the core meaning of the data. (Erlingsson & Brysiewicz 2017, 94-95.) The researchers transcribed all interview answers and gathered them into one table. Data was organized and grouped under each question and simplified in a way that the essential content from the answer was inserted in to the table. Finally, simplified answers were analyzed and grouped by the main themes of the interviews. The main themes are cooperation, communication and giving resources to projects; objectives and motivation for cooperation; challenges and pain points in the cooperation as well as aspects on the learning platform.

Users' views are essential when an organization wishes to improve its services. The users are the ones who desire services and are the best people to explain their experience at different touch points. The interview sessions with the companies and the representatives of the research and development unit in Turku University of Applied Sciences gave more insights to the fact that all collaborators desire to have a better Topinpuisto. A Topinpuisto that can contribute to the wellness of the region through its activities and a more engaging learning platform. The following sub-chapters present the main findings and aspects gained with the interviews.

Cooperation, communication and giving resources to projects

Interview insights concerning the status of Topinpuisto cooperation, communication, amount of projects done or project possibilities are presented in Figure 13, where blue boxes are company answers and purple ones from university representatives.

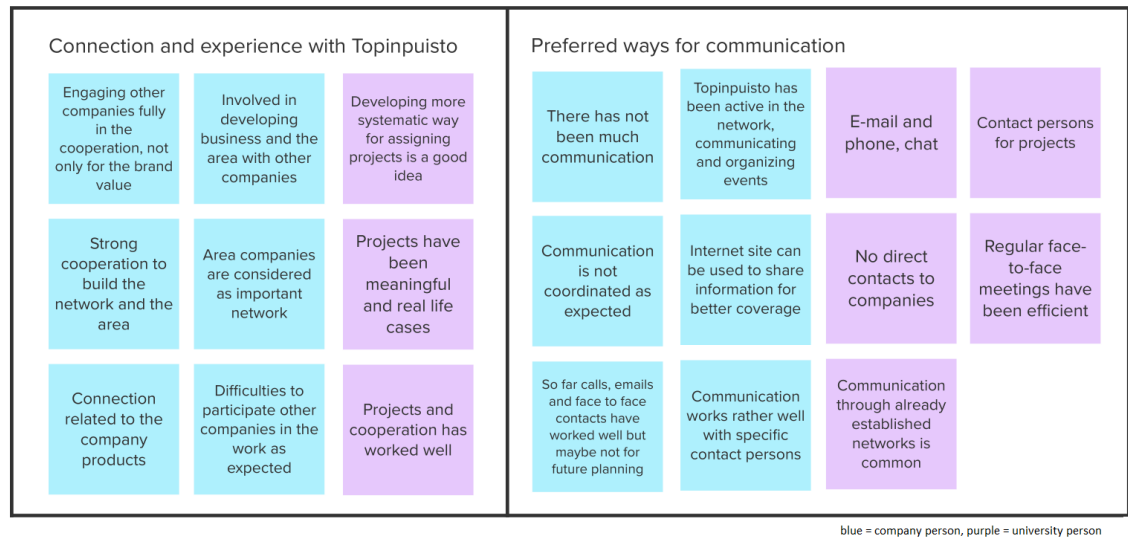


Figure 13. Current experience and communication with Topinpuisto.

Companies perceived there is a strong cooperation to develop business and build the circular economy network in the Topinpuisto area. The company representatives valued cooperation in the network and it was considered as important, but still there were opinions that some companies could engage fully in the cooperation and not be part of the network only for the brand value of it. Current ways of communication showed that there was a preference to communicate within the established contacts and traditional ways of communication have been enough. Topinpuisto was seen active in communicating and organizing events in the network but some felt that communication could be improved, both the amount and coordination of it. The experience concerning student project cooperation varied; some companies had no or only little experience with student projects while others had done several projects, mainly thesis and internships. University lecturers experiences about the current cooperation were good, they were satisfied that projects had been meaningful and offered real life cases for students. Obviously, they had experience in several project types, varying from research projects and thesis to innovation camps and research hatcheries. Cooperation had worked well and they preferred to communicate through existing contacts, with regular face-to-face

or online meetings or via e-mail, phone and chat. They had not had specific contact persons from companies, apart from company contact persons related to projects. In addition, the university representatives thought that developing more systematic way for assigning projects was a good idea.

The researchers also wanted to find out how many projects companies could have in the future and how much resources they would be able to arrange for projects. In general, the companies could not say any exact numbers how many projects they could give during a year but they were open to the project possibility and foresaw good opportunities to have several projects in a year. Concerning resources, the general understanding among respondents was that resources will be available as long as the project has a clear target and it is both important and beneficial for all parties.

Objectives and motivation for cooperation

Different aspects for objectives and motivation for cooperation are presented in Figure 14. The interviews showed that companies saw the cooperation with Topinpuisto as an avenue for cross business cooperation, through which they can share good practices, develop common things, market their own company products but also to increase environmental awareness. More companies are welcome to join the network and join the physical area of Topinpuisto. Topinpuisto network companies were seen as common ground for research with great possibilities and ideas for growing business and through cooperation, there was a wish to move circular economy to the next level and develop sustainable business models. Students were seen as future resources, already being circular economy professionals. University representatives pursued cooperation with Topinpuisto because on one hand they wanted to prepare students for working life by offering them real life cases whereas on the other hand they wanted to ensure the company growth, help companies to flourish and strengthen regional business activities.

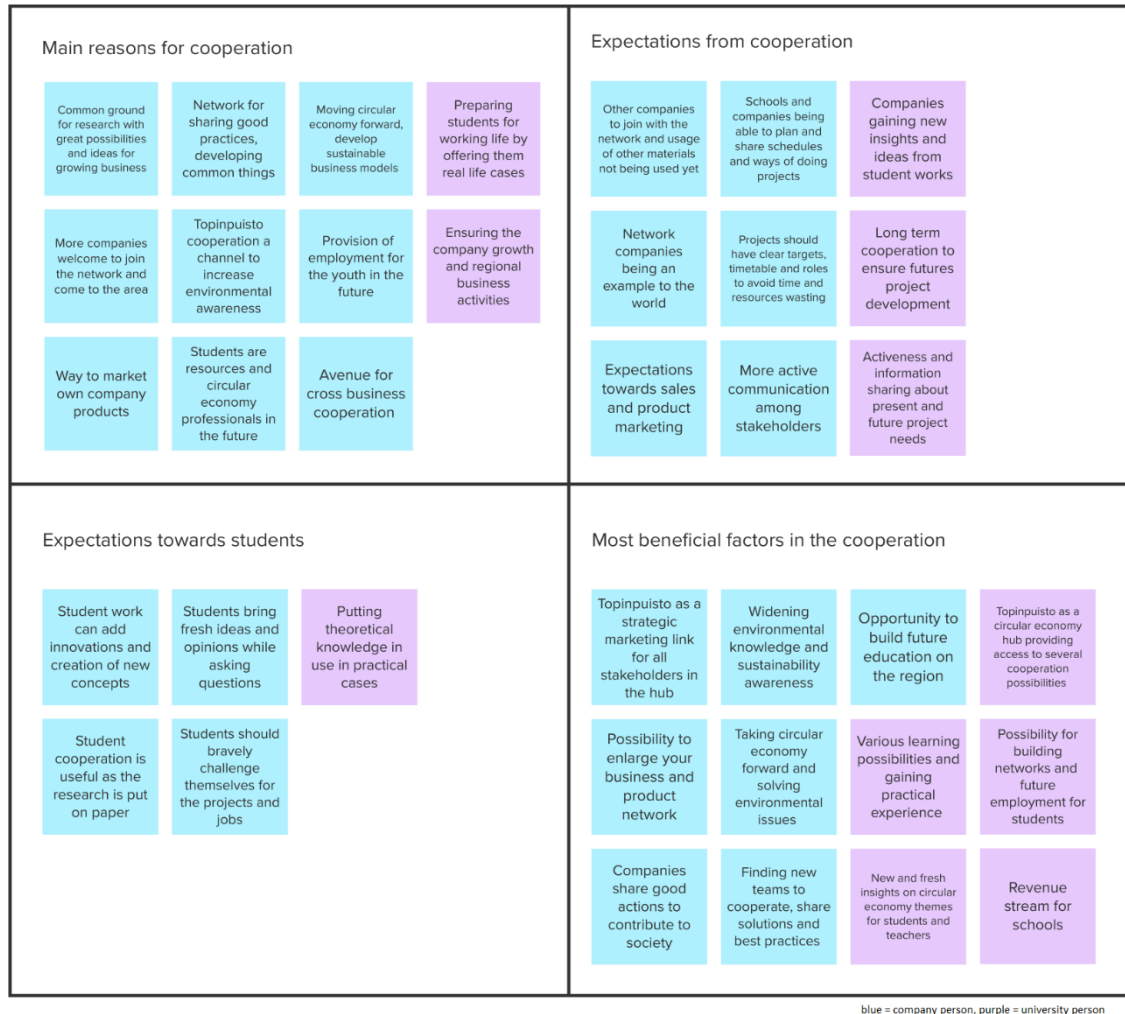


Figure 14. Objectives and motivation for cooperation.

Company representatives' expectations concerning cooperation focused at more active communication among stakeholders, participation to the network and towards sales and product marketing as well as more efficient usage of material resources. In addition, regarding student cooperation the expectation was that projects should have clear targets, timetable and responsibilities, in order to avoid wasting of time and resources. University representatives expected activeness and information sharing about present and future project needs. They perceived that long-term cooperation would be the way to ensure future project development and through the cooperation, companies would gain new insights and ideas from student works. Companies expected students to bring fresh ideas, add innovations and creation of new concepts in their business. In addition, they were expected to bravely challenge themselves with the projects, bring out their opinions and ask many questions. School expectations towards students was to put

theoretical knowledge in use in practical cases and companies saw the benefit of putting the research on paper.

When thinking of the value and most beneficial factors of the cooperation, companies wished that the physical area of Topinpuisto could display companies' activities where visitors can actually feel and view the technologies involved in waste management. This was also seen as a marketing strategy where Topinpuisto was the strategic link for all stakeholders in the circular economy hub, through which environmental knowledge and sustainability awareness can be widened. Companies in the network shared good actions to contribute to the society, and through cooperation, it was seen possible to take the circular economy to the next level and solve environmental issues. Cooperation was seen as a possibility to enlarge business and product network whereas university cooperation provided an opportunity to build future education on the region. In addition, Topinpuisto was considered as a place to grow professionals that can offer future employees to companies. Universities valued Topinpuisto cooperation since the circular economy hub provides access to several cooperation possibilities and a chance to gain new and fresh insights on circular economy themes by providing various learning opportunities and practical project opportunities. Students also have the opportunity to build networks and possibly be employed by the companies in the future. In addition, cooperation was valued as it is a way to gain revenue for universities.

Challenges and pain points in the cooperation

Different aspects of challenges and pain points in the cooperation are presented in Figure 15. The company interviewees felt that there are special challenges in having a common view for developing Topinpuisto and getting the physical land area ready. Topinpuisto could make different technologies more visible and build physical demos for people to see. Companies recognized differing views in the willingness to invest money on Topinpuisto or participation in solving practical issues. Cooperation was felt too slow and arranging timetables difficult. Regarding student project cooperation, the company interviewees raised up a fear of wasted time and resources for projects with uncertain results, managing time and resources for example for project supervision as well as lack of collaboration tools for the convenient communication during projects. University interviewees felt that Topinpuisto cooperation relies too much on one department and thus they should interact more with other Research and Development units as more

potentials and studies are realized that way. In addition, the learning platform should be marketed via different channels, for example in social media, different company events, by using connections to public organizations and head of business of municipalities or to Finland Proper entrepreneur organization. Promoting learning environment was seen crucial since if there is no awareness, the companies are not aware of the services of Topinpuisto. Other development areas to Topinpuisto according to university interviewees were lack of company contact persons in projects, alignment of project development work with school schedules and inflexibility of project schedules. The current problem was receiving too many ad hoc project needs, with no flexibility. Additionally, information on websites should be checked that it is clearly presented and easy to find. Companies wished that school products could be presented on the website.

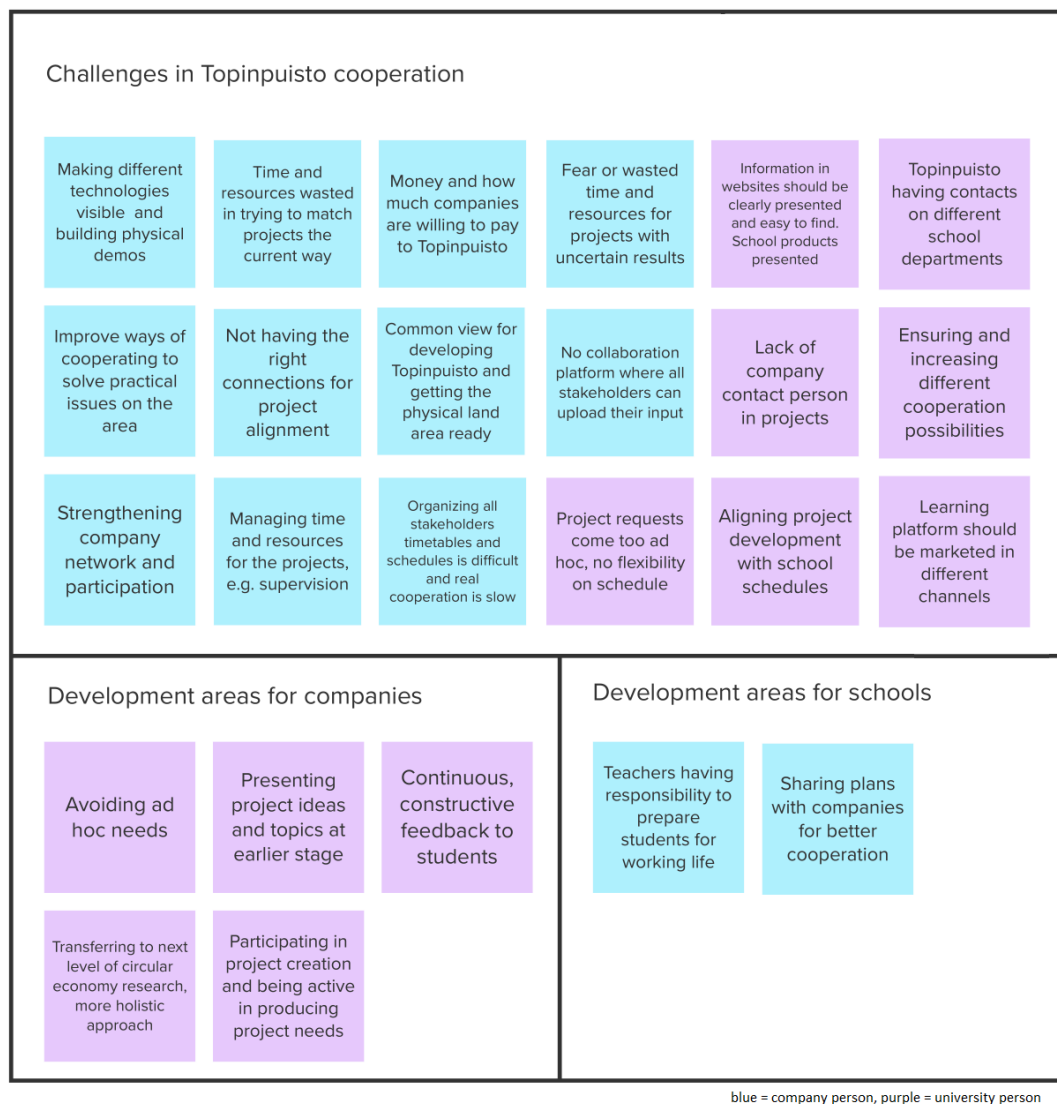


Figure 15. Challenges in cooperation.

When evaluating the cooperation with companies, the respondents saw that companies should specifically focus on planning the project needs and avoid ad hoc project requests with tight schedules. It was hoped that the learning platform site could put a stop to the ad hoc way of working and projects would be planned in a more focused and straightforward way. The companies should participate in project creation and be active in producing projects. It was highlighted that projects topics or ideas could already be presented to schools already in the idea phase and research topics could be transferred to the next level of circular economy research, away from material research to a more holistic approach. Continuous feedback to students was also seen important. The companies, for their part, saw that schools could also share their plans with companies and elaborate more the different types of school products and their content. In addition, schools and teachers should ensure preparing their students for working life and that student's skills and abilities match with project demand.

Aspects on the learning platform

User aspects on the learning environment are presented on Figure 16. When asked how different project assignments should be matched, the respondents' views varied but mutual views were found on both sides. Some of the interviewees, both from companies and the university, felt that best way would be to have regular face-to-face meetings with Topinpuisto contact persons. Others, for one's part, felt that having an avenue to request projects assignments or displaying available projects and contact information on the platform would be convenient. Some company representatives felt that projects could be agreed directly between companies and schools and university representatives felt that longer cooperation, where projects could be built on one another, would be ideal.

On improving the Topinpuisto learning platform and regarding important information available when assigning projects, users wished that projects should have clear targets, scope and goals so all parties would know what to expect. This way schools and companies would be able to harmonize problems and find ways of solving them easily on the platform before the actual work starts. The stakeholders wished to see a site where it is easy to connect companies' ideas with potentials from school. When the teams and goals of the companies would for instance be highlighted, schools would be able to integrate these ideas in their curriculum for future purposes. It was wished that the learning platform could highlight contact persons and timetables of available projects.

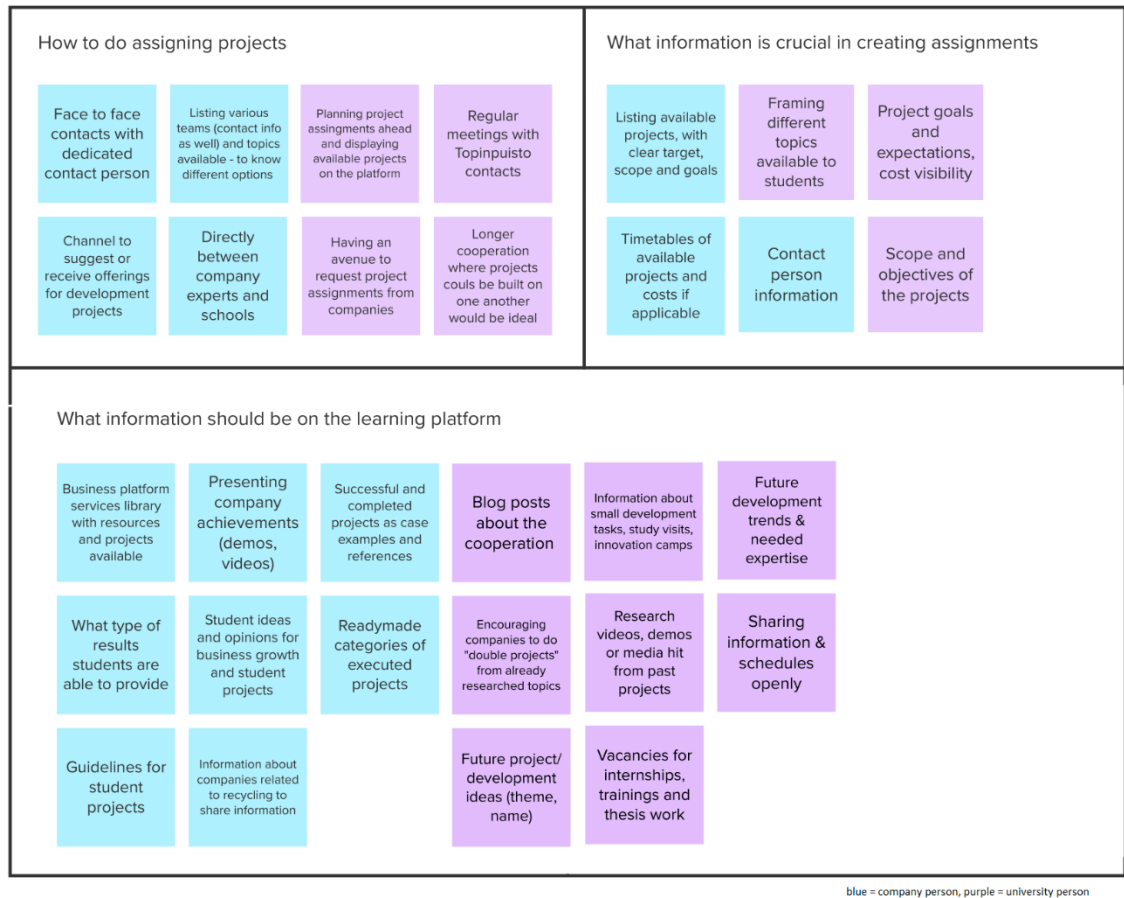


Figure 16. Aspects on the learning platform.

Regarding other information that the learning environment should contain, the users had various ideas. The platform should promote companies successes, serve as a medium to display what the companies are doing and what are the benefits from it, in terms of video and demo clips showing companies activities. Successful and completed projects should be categorized and presented as case examples and references, and these would also further enlighten all as to what results students are able to offer and provide. Students themselves could also contribute to the platform by presenting their ideas and opinions for business growth and as student projects. Schools could provide information about the different research frameworks, such as study visits and innovation camps. Their wish was also, that in addition to open projects, companies would post information about open vacancies for internships, trainings and thesis work. Companies could also think of having so called double projects with students, meaning students would get projects about research topics that the company has already researched. This way they would diminish the risk of wasting resources or not getting any results but would have the possibility to gain even more insights for the topic from the student groups.

Furthermore, another insight was to have information about upcoming development trends and needed expertise in the future. There could be blog posts and media hit showing different outstanding cooperation's and researches made as that would easily encourage new companies and partners wanting to collaborate with Topinpuisto.

5.2.2 Personas

Personas help to make groups with similar service needs more understandable. They represent an archetype of the service user, should be based on research and represent a group of people with shared needs or common behavior patterns. They help to understand customer needs and tasks they are doing in the service. (Stickdorn et. al. 2018, 40-41.) Drafts for personas were created in order to understand which user groups the personas represent and what their expectations for the service are. The personas were reviewed with the commissioner representative Johanna Liipola on 14.4.2020 to get confirmation to the relevance of the created user groups. As personas must be based on research results, they were updated and finished with information gained from the interviews about the users' expectations and experiences, pain points and motivations. Three personas were created based on the research: a Development Manager from a larger company, an entrepreneur with her own company and a university lecturer. They are presented in Figure 17, Figure 18 and in Figure 19. Besides presenting the archetypes of the users, the personas reflect their motivations and challenges as well as their desires towards the learning environment.

Figure 17 and Figure 18 present the Development manager and the entrepreneur. These personas have an essential role in developing their company's products and services as well as in searching new innovations. For them the main motivation for cooperation is the possibility to gain fresh views and new opinions to the business but also to strengthen the regional circular economy through cooperation. Student projects offer them a possibility to hire people already with practical experience from the field. Small companies gain from the cooperation as their resources are often more limited but cooperation provides them extra resources. Challenges show that companies often do not have time to plan appropriate projects for students or they might not have needed resources to address the project. They also do not know what to expect from universities, students or the project results and thus they can be hesitant towards the cooperation.

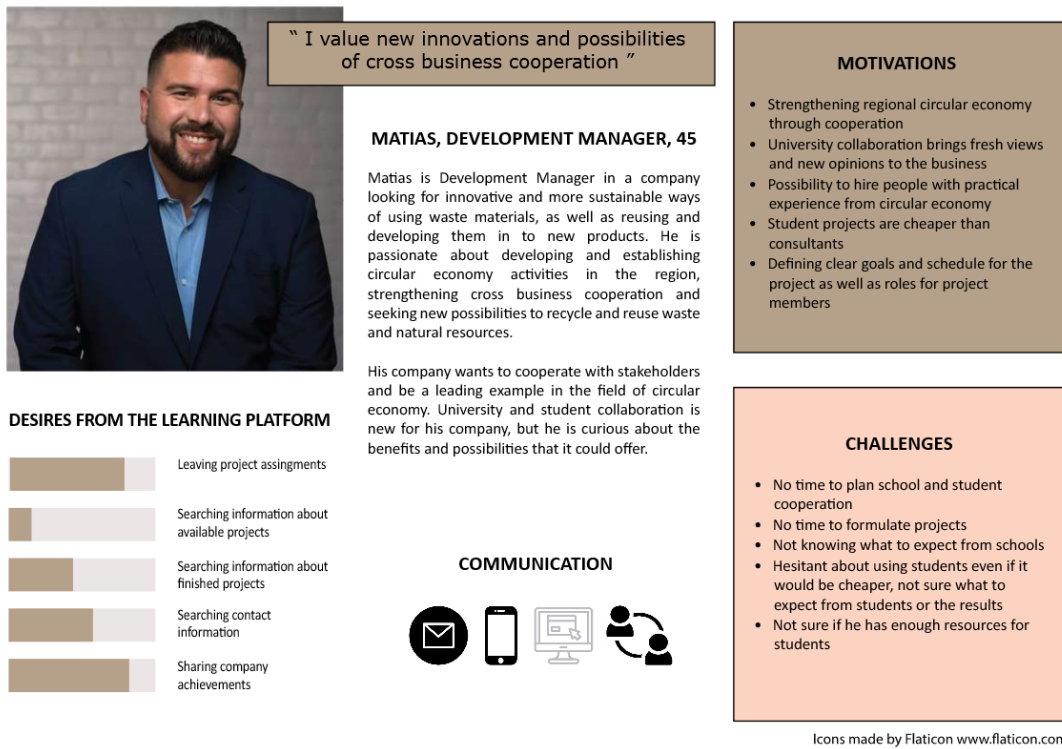


Figure 17. Persona 1, Development manager.



Figure 18. Persona 2, Entrepreneur.

Figure 19 presents the third persona, a lecturer. The main motivation for lecturers is on one hand to prepare students for working life but on the other hand to help the companies in the region to flourish. For educational institutions, it is important to offer students possibilities to work in real-life projects and develop their skills while applying their theoretical knowledge in to practice. Goal for the projects is to be able to offer practical solutions or new ways of doing business. The main challenges for lecturers are that the project needs often come as ad hoc and with too tight or unrealistic schedules. The project focus or goals might also be unclear and it may be difficult to match project needs with relevant courses. In addition, project cooperation might be challenging if the companies do not have time or resources to allocate for the projects or to provide guidance to students.

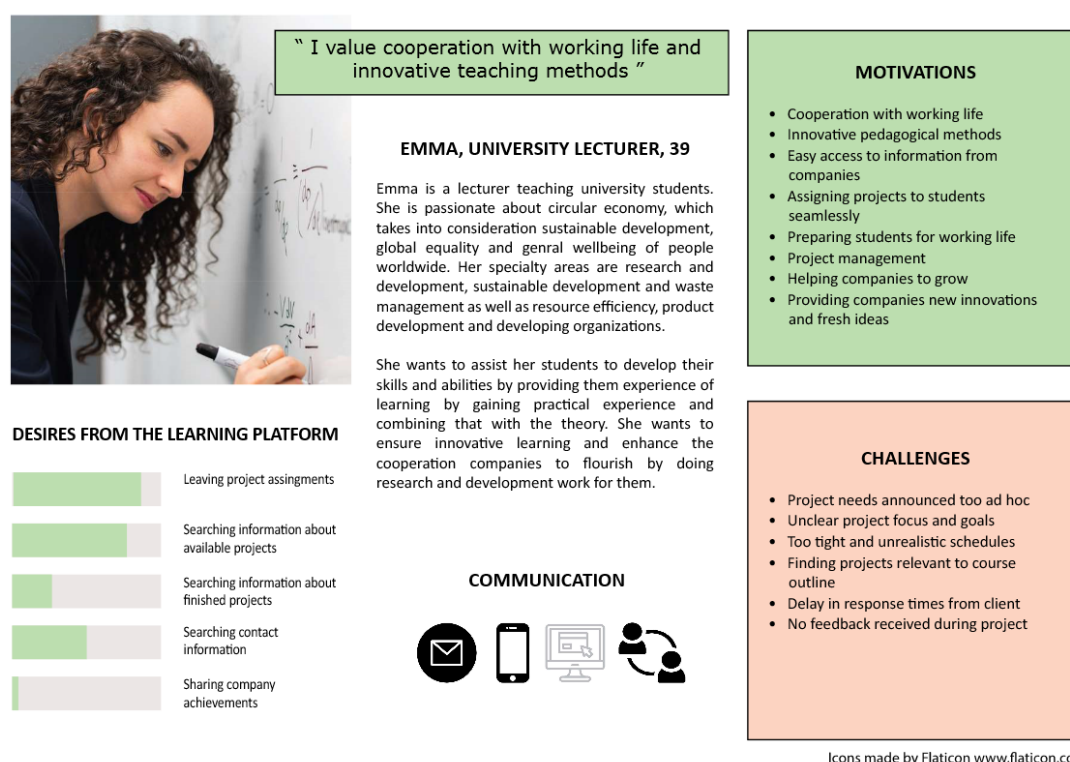


Figure 19. Persona 3, Lecturer.

All the personas show that used communication methods currently are e-mail, phone or face-to-face meetings. Their expectations towards the learning platform demonstrate that company customers would use it for leaving project assignments, searching contact information and information about reference projects as well as sharing company achievements. Entrepreneurs would also be interested in available projects requests

from schools. Teachers for one's part would desire to use it to establish project needs, search information about available projects as well as to search contact information.

5.2.3 Customer journey map

Customer journey map visualizes the experience of a person over time and can be used to describe the whole end-to-end process of a service. Maps are made from customer point of view and they help to describe all the key steps in the process also the ones when customer is not interacting directly with the company. As journey map contains all the stages and steps in the customer journey, they can be used to identify customer moods and the pain points, successes or opportunities in the process and can be used to develop the process. (Stickdorn et. al. 2018, 43-47.)

Two customer journey maps were created for the project: one to represent the company customers' journey with a need to collaborate in new fields of research and benefit from university cooperation, and the other to represent the university lecturers' customer journey contacting Topinpuisto on a possibility for project work. The maps were created alongside with the interviews, and insights from the interviews were used to recognize all the steps in the process, customer's emotions and the main challenges. This helped to build the customer journey on the research data. The maps were created by using a template, which was modified to suite the purpose of the customer journeys. In addition, the customer journey maps were reviewed with the commissioner representative Johanna Liipola on 28.4.2020. Visualizing customer journeys helped in understanding the customer experience, the needs and the emotions of the users regarding the current service. They also helped in identifying bottlenecks in the present process and coming up with improvement areas from the point of view of the customers that could be adapted to the learning platform.

Customer journey map for company customer is presented in Figure 20 and Figure 21. The customer journey is divided in two pictures, representing different phases of the journey. Figure 20 contains the first steps of the journey from information phase to agreeing on assignments. Here the company recognizes project need, contacts Topinpuisto and discusses with them about the project need and possible projects. Later on the company is contacted by the school representative and project cooperation is agreed. The emotional journey demonstrates a slight shift from positive to neutral but this may vary depending how easily and efficiently the process goes and an agreement

is made with an educational institution. E-mail, phone and face-to-face conversations are most common communication methods. The pain points demonstrate that lack of time is evident and thus the companies may not have time to formulate project frame and goals or set resources. Whereas Topinpuisto personnel might not have time to work with the project idea and help the company. The companies do not have direct contacts with schools and they have no visibility to the process between Topinpuisto and schools. Possible solutions contain enabling direct contacts between companies and educational institutions, which would reduce possibility for errors and make the process quicker. When agreeing contract, possible pain points are that the project scope is not clear or the timetable is too tight. Schools may not be able to start within the schedule what the company wants. To avoid these problems, the companies could contact schools as early as possible, even when the project idea is not clear. By establishing dialogue as early as possible, schools could adapt projects to their schedules and companies would get more information what the schools can offer and how the project need could be accomplished.

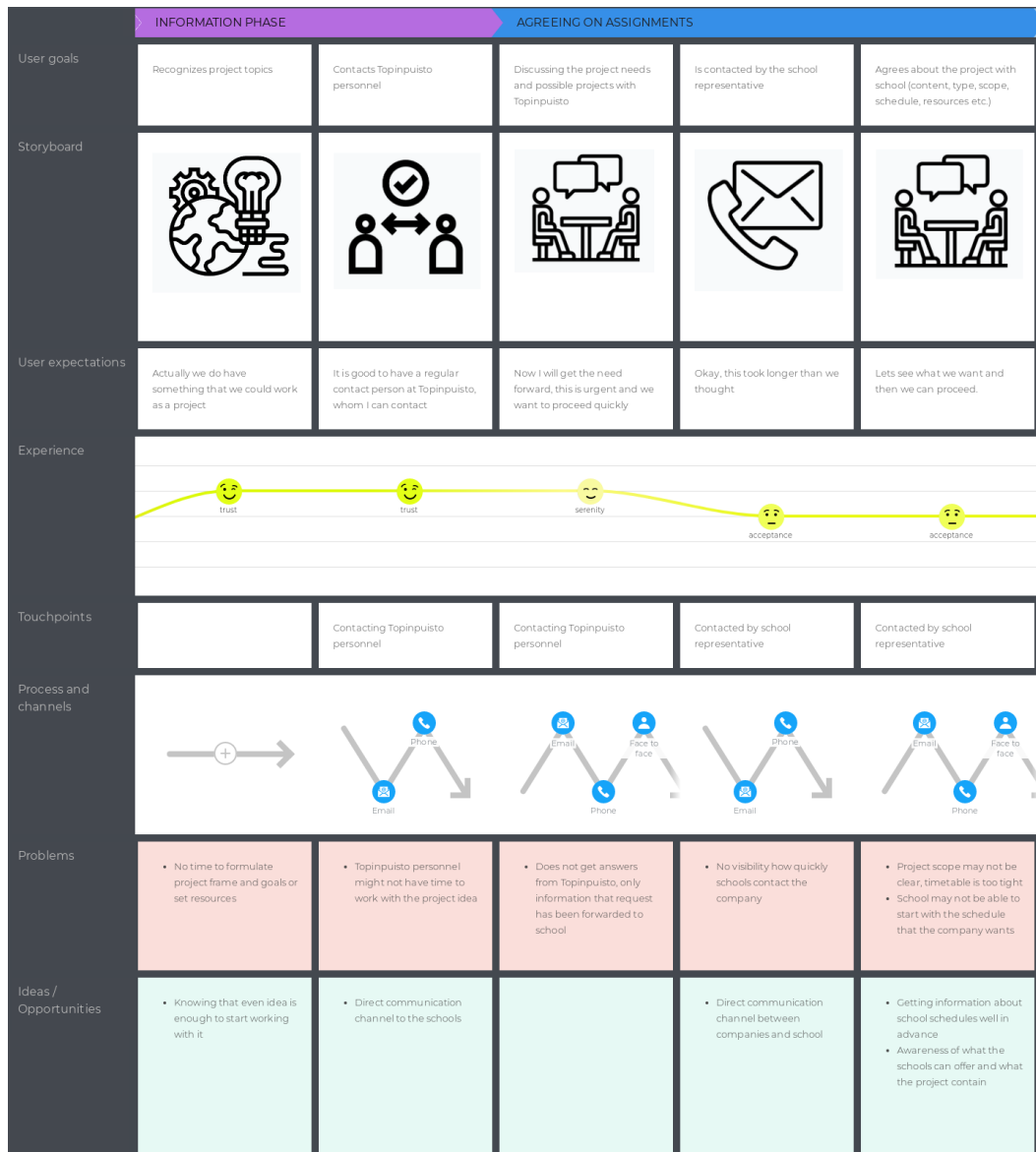


Figure 20. Customer journey for companies: information and assignment phases.

Figure 21 contains project phase and finishing projects. Project phase contains signing contract with school, start of student project and students performing the project for the company. Finishing projects contains project closure with school or Topinpuisto and giving feedback to participants. Emotions on the journey vary and most negative emotions can be experienced on the project phase, due to the uncertainty how the project will fulfill the company expectations. E-mail and phone remain as the main communication methods in all phases and this also creates some pain points. For example, currently there is no convenient way of signing the project contract online, but documents are scanned and sent via e-mail. In addition, there is no collaboration

platform where project communication could be directed but e-mail is used. Besides communication tools, unclear issues and pain points were also found in project scope, goals, roles as well as in resources to guide students or in project closure and feedback sessions. It was noticed that common ways or a framework to run the projects could help the practical execution. For example there could be regular online meetings to go through unclear issues and check the project progress and status. Also, joint session to go through project results and to give feedback would bring structure to project work.

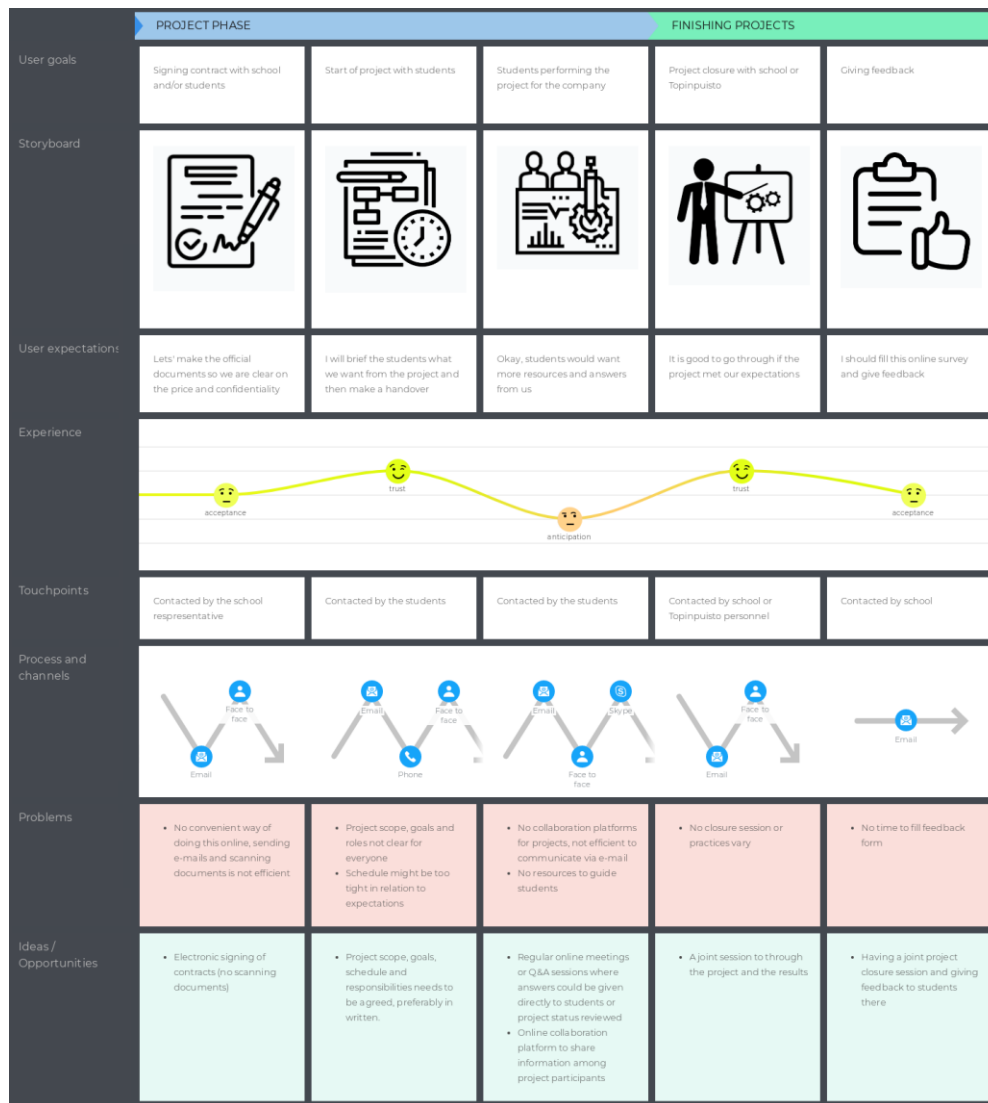


Figure 21. Customer journey map for companies, project phases.

Customer journey for lecturers is presented in Figure 22 , Figure 23 and Figure 24. Figures 22 and 23 contain the first two phases of the customer journey: information phase and agreeing on assignments. In information phase it is characteristic that the

school representative gathers information about needed student projects, then contacts Topinpuisto and follows up on the request. Here traditional communication methods, phone and e-mail, are used. Agreeing on assignments contains several steps, which involve discussions both with Topinpuisto representatives and the company representatives until a project agreement is made. The emotional journey can vary, depending on how long it takes to establish contact with Topinpuisto or the companies. The biggest pain points in the steps concern information about possible projects as well as communication and contacting parties. University lecturers have no visibility to project possibilities provided by companies in the Topinpuisto network or no information about project needs of companies. Project needs often come as ad hoc and their content might be unclear or unrealistic and as a consequence there might not be any students available to perform the projects. Furthermore, teachers need to know whom to contact but they have no contact information to companies. These issues could be solved with the learning platform and the usability of it in sharing project possibilities and contact information. Project ideas could be shared well in advance and project topics could be brainstormed together with companies so that the course schedules could be met.

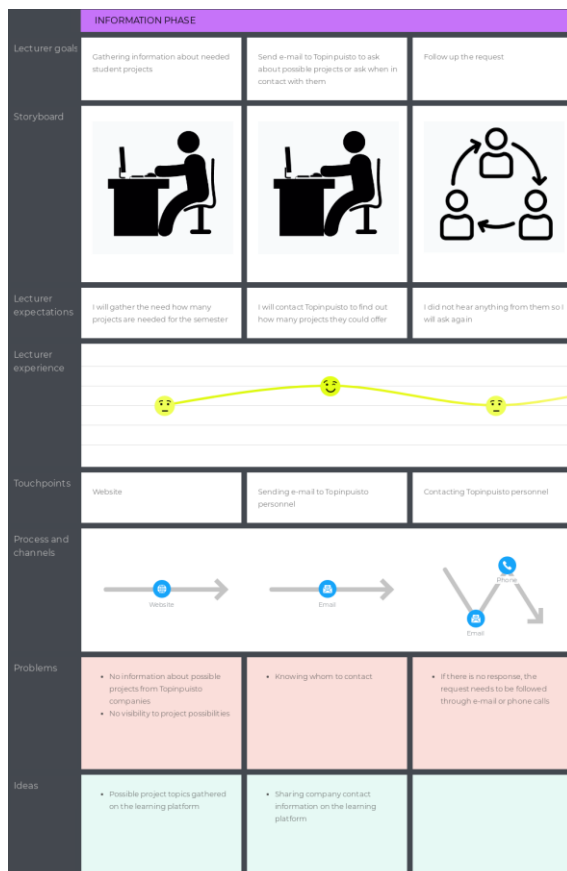


Figure 22. Customer journey map for lecturers, information phase.

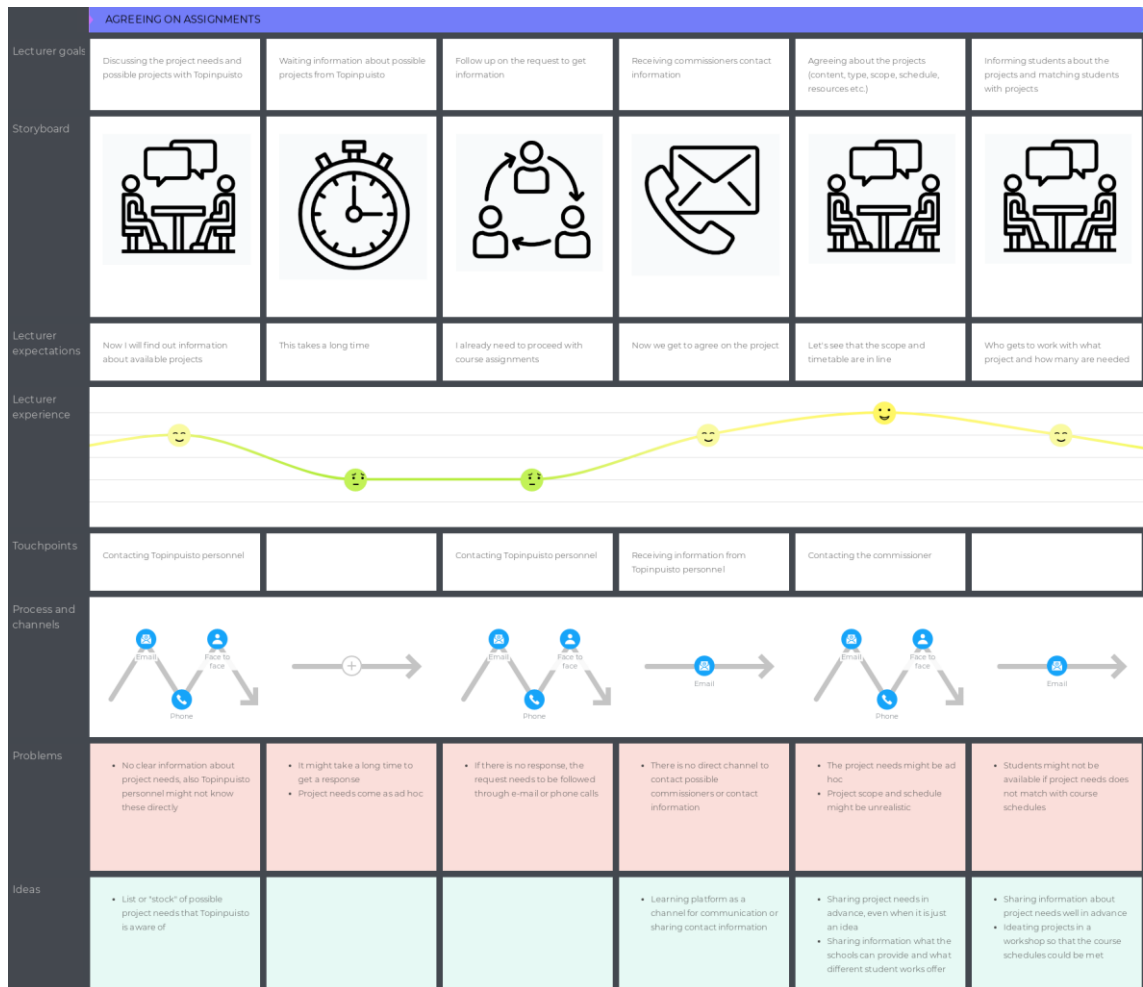


Figure 23. Customer journey map for lecturers, agreeing on assignments.

Figure 24 presents the project phase and customer steps after finalizing the project. These phases contain signing contract, executing the actual project as well as project closure, sharing results and feedback. Communication in these phases is mainly done via e-mail or skype or face-to-face meetings. Painpoints in these steps relate to actual performance of the projects: it might not be clear for students what to do and what is wanted from the project. Companies might not have enough resources for the projects and students can face difficulties in conducting the projects, one of them being that response times from companies might also be long. In tackling these issues, defining the project scope, goals and schedules would help students to know what is expected from the project. Teachers could support students more in the projects but other means of “raising the flag” towards companies might be needed if project goals are not met or the communication is not sufficient. Regarding finishing of projects, the practices may vary a lot and there might be no feedback from the commissioner to students. For this,

structured ways of ending projects could be agreed and joint project closures with feedback could be efficient ways of working.



Figure 24. Customer journey for lecturers, project phases.

6 IDEATION OF THE LEARNING ENVIRONMENT

This chapter focuses on ideating solutions for the learning environment service as well as to the actual learning platform. Ideation was done with different methods and it was done both by the researchers and by participating internal and connected stakeholders. Due to limited research scope and resources, external stakeholders, such as students, were not participated in the ideation. Thus, the ideation focused on the aspects of companies and educational institutions. The researchers performed value proposition canvas and a brainstorming session. With stakeholders, the researchers ideated learning environment and brainstormed project categorization in a workshop. Ideation phase focused on the aspects gained during the research and aimed to develop and regenerate these insights into concrete product ideas desired from the learning platform. In the end, all research and ideation results were gathered and analyzed with an affinity diagram, resulting two main themes. This chapter presents the ideation tools and methods, results gained with ideation as well as the overall results concerning the learning environment and what should be considered when designing the new solution.

6.1 Value proposition canvas

Value proposition canvas is a tool to view customer motivations in business settings. On one hand, it helps to understand better the users' needs and motivations while on the other hand, it helps to think what the company or business can offer to the customers, which would help to solve the customer needs. Value proposition canvas is made a specific customer segment or a persona in mind and it is divided in two parts: the first part is about the users' needs, pains and gains and the second part is about the pain relievers, gain creators and the products or services that the company offers or can offer. (Pijl et. al. 2016, 106-110.)

The user part of value proposition canvas focuses on the jobs that the customer is trying to get done and what pains and gains he is experiencing during the process. Jobs to be done can for example be functional or social but usually there are basic needs behind them. Pains describe what the user is annoyed or troubled by, and what is hindering or preventing him to perform his tasks. Gains for one's part describe what the outcome is that the user is expecting, what would make him/her happy or exceed his expectations.

It is important to notice that gains are just not opposite of pains but more like hidden ambitions that people have. They can have social benefits or functional and financial gains. The business part of value proposition canvas focuses on how the company could help the user to perform his actions and what would help in releasing the pains or achieving the gains. When recognizing what would help in solving the gains and pains, it is easier to focus what the product or service should be and how it should work. (Pijl et. al. 2016, 106-110.)

In this research, the value proposition canvas was used to recognize the users' needs and motivations towards the service. The pains and gains were updated based on the information and insights gained from the research phase. The expectation was that the canvases would help in recognizing what elements are essential in the learning platform and what are not. Furthermore, help in building a valid prototype when planning the service. The value proposition canvases were prepared after the interviews and they were prepared both for company customers and for educational institutions by using an existing template from Strategyzer. These canvases are presented in Figure 25 and in Figure 26.

The value proposition canvas for companies

Figure 25 presents the value proposition canvas for companies. From the insights gathered on what is paramount for the companies, it is obvious that their main motivation was finding an avenue to present their works to the larger society. Showcasing their results to a wider audience was adding value to their work. Engaging students in their work would help companies in looking ways of testing innovations and processes or developing and optimizing them. The experts in the companies are familiar with the practical aspects of their work since it is what they engage in on daily basis but having students to perform theoretical analysis or to evaluate latest research information would also bring value.

The analysis showed that companies have a lot to gain when involving themselves in the cooperation. It provides strong and reliable networks for future projects since these established contacts and network of organizations would offer several possibilities for future projects. The participating students would be potential future employees who could help in bringing more innovations to the company or getting the right markets for their products. Students, for their part, get exposed to the world and a change to strengthen

their skills by accomplishing projects to companies. Pains of the collaboration relate to lack of time to guide the students, lack of project resources or insufficient communication. This, for one's part, can lead to lack of student commitment or to poor project execution by the students, which in turn would realize the company fear of losing time and money.

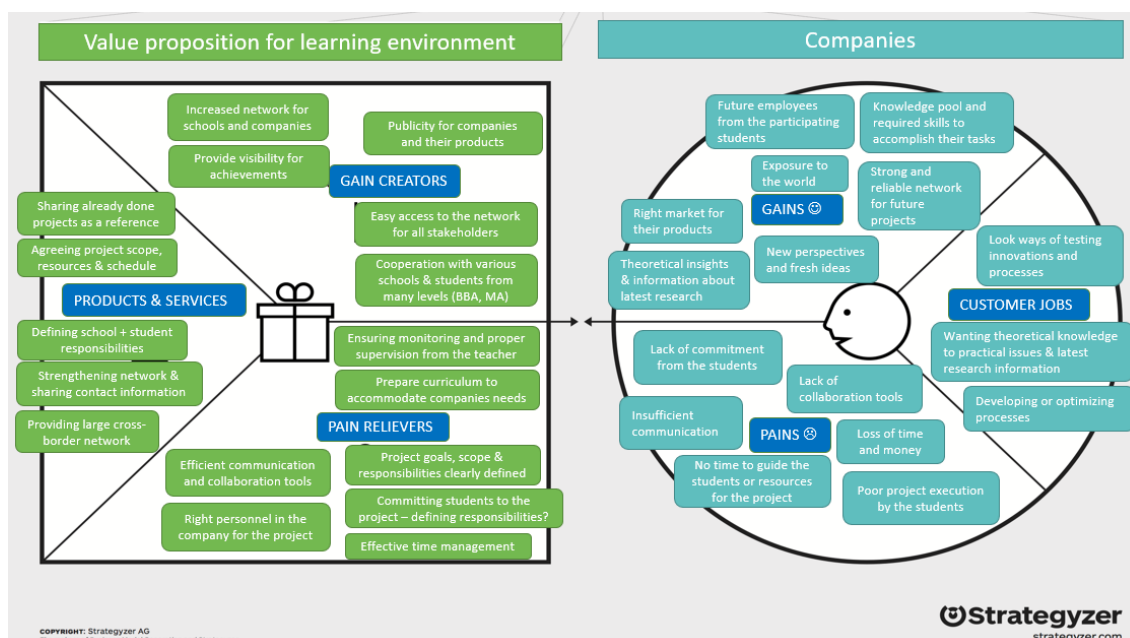


Figure 25. Value proposition canvas for companies.

Value proposition map has a side of elements that can relieve pains for the companies. The pain relievers are mostly services or actions expected from educational institutions. For example, for the companies to maximize the opportunities embedded in the relationship, teachers would need to ensure efficient communication and collaboration tools, student commitment to the projects as well as to ensure proper project monitoring and supervision. Responsibilities of parties should be clearly defined and monitored and the companies should also ensure they have right personnel in the project. With effective communication, it is easy to prepare the school curriculum to accommodate company's needs, thereby creating effective synergy in achieving the aim of collaboration. The learning platform, for one's part should reflect defining project framework and agreeing on project scope, resources and schedules as well as specifying responsibilities. These would create value for companies, when executing project cooperation.

Several factors were found to create gains for the companies. One of such is that it would provide large cross border network, companies would be able to integrate efforts in different perspectives and one company's waste could be turned another company's raw

materials. Another gain would be an avenue to provide visibility for achievements, on the part of all stakeholders, be it students, schools or other companies. Providing an avenue to share achievements and strengthening the network and sharing contact information are such where Topinpuisto should focus on and try to incorporate to the learning platform as these are valued by company customers.

The value proposition canvas for educational institutions

Figure 26 presents the value proposition canvas for educational institutions. The insights demonstrated that educational institutions aim to find and match projects for students and search companies who allow real life projects for students. The main issue for university lecturers was to find appropriate projects that fit to the curriculum of the studies and provide students possibility to exercise and develop their skills and get working life experience. Besides offering possibilities for students, the educational institutions also support and enable development of regional companies as student cooperation offers companies a cost-efficient way to do research and development or develop their products and services. Pains of the collaboration relate to finding relevant projects with realistic scope and timetable or being able to plan the projects in advance and according to course schedules. In addition, companies should prioritize projects that they would have time or resources to guide students.

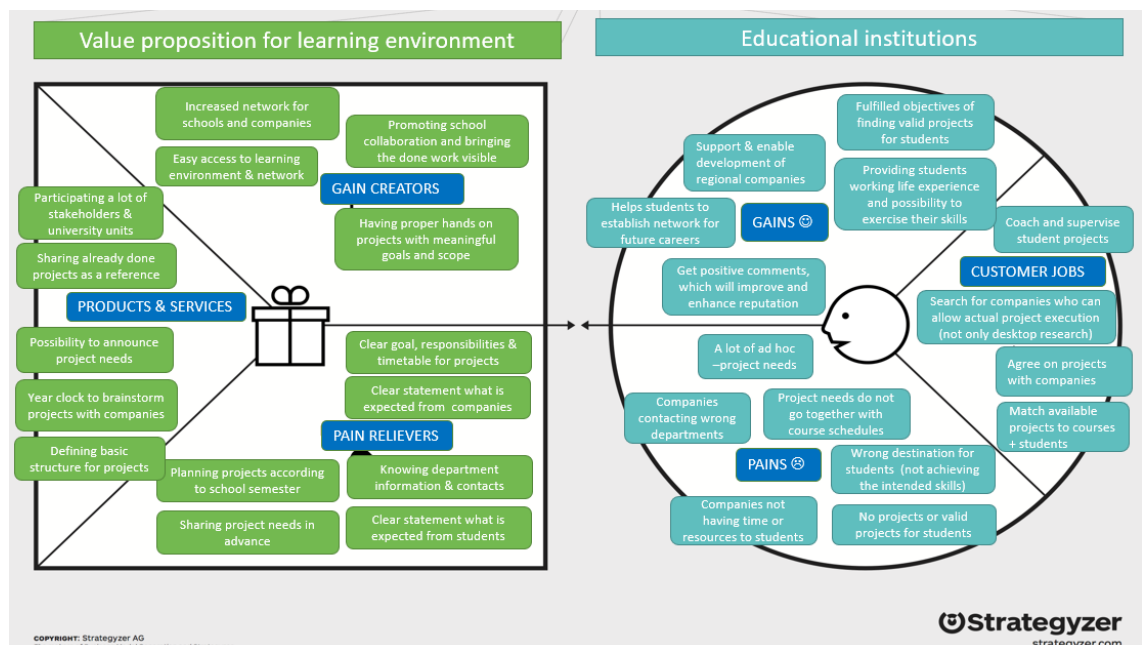


Figure 26. Value proposition canvas for educational institutions.

When thinking the value proposition for learning environments regarding educational institutions, the identified pain relievers focus mostly on agreeing on the projects and communication with companies. Educational institutions would benefit from getting the information about project needs as early as possible and even better would be if projects could be planned according to school semester. Regarding project agreement, it would be essential to agree on clear goals, responsibilities and timetables for projects. Responsibilities include statements what is expected both from the companies and from the schools. Towards the learning environment, solutions like possibility to announce project needs, year clock to brainstorm projects with companies or defining basic structures for projects would benefit educational institutions. Time management would become easier for teachers and they could plan courses in advance, instead of the ad hoc surprises. In the learning environment, expectations from all stakeholders would be clear and timetable is easily set for completion.

Gain creators for educational institutions relate strongly to the jobs they are trying to perform: enabling student projects and supporting regional companies. Learning environment would make visible an increased network of educational institutions and companies. Easy access to the network would help in making contacts and possibly help companies to contact educational institutions directly. Promoting university collaboration and bringing the done work visible would benefit both universities and companies as well as enable displaying already done projects as references. Thus, in order to help university users, essential for Topinpuisto would be to ensure a well-functioning project assignment framework as well as to focus on participating many stakeholders on the platform and to have a structured way of working with them to ensure that new project topics are created on a regular basis.

6.2 Learning platform ideation with stakeholders

An ideation workshop with stakeholders was planned to be held on 19.5.2020. During the interviews, the researchers had asked the willingness of the interviewees to participate in the workshop. All initially agreed and the schedule was set to meet the participants' availability. However, on 19.5.2020, only two stakeholders joined the session and due to lack of participants, the workshop was postponed. Despite cancellation of the workshop, the researchers decided to empathize with the service users and conducted the prepared workshop tasks. This exercise was done on

22.5.2020 and the goal was to set in the position of the users and brainstorm user insights for the learning platform. Description of this brainstorming and the results can be found from Appendix 3. The results were included in the analysis of all research results.

An ideation workshop with key stakeholders took place on 3.6.2020. It was held as an online workshop via Zoom and Mural was used as a platform for people to share ideas and post their thoughts and proposals. The workshop had seven participants covering internal and connected stakeholders, both companies and educational institutions as well as the commissioner. The participants' expectations from the workshop were for example to hear point of views and share perspectives, cooperate and share information as well as to get to hear how other companies experience the learning platform. The planned workshop time was two hours and the researchers had prepared two main topics for the workshop session. The first topic was about project brief central areas and what information is needed in order to have a successful project between companies and universities. The second topic was about project categories planned to be used for the learning platform to categorize both already done projects and upcoming projects. The goal was to ideate how projects could be categorized in a way that serves all the stakeholders. Overall goal for the workshop was to gather aspects and aspirations from stakeholders, which could be used in designing the learning platform.

6.2.1 Task 1: Project assignments and student projects

First topic of the workshop concentrated on agreeing project assignments and question set to workshop participants was: How can we make successful student projects, which A) bring value and results to companies, B) exposure students to real life cases and problem solving and C) advance circular economy and create innovations? The chosen method for this theme was Disney method as it is suitable for exploring ideas and allows the team to discuss an issue from four different approaches. In addition, it involves parallel thinking to analyze a problem as well as to generate and evaluate ideas, and it provides workable solutions. (Curedale 2013, 322.) Due to limited time, the researchers' prepared three aspects to be discussed and these were the dreamers view, the realist view and the critics view. The assumption was that these aspects would evaluate the topic from all relevant points of view and bring out the most essential elements from a

project assignment as well as the challenges. Results of this exercise are presented in Figure 27, Figure 28 and in Figure 29.

Dreamers view focused on visioning everything that is possible and stakeholders were asked to write down their desires and visions from the cooperation, without a need to concentrate on possible restrictions or limitations. The brainstorming provided results concerning awareness of Topinpuisto learning platform and willingness to join the network; contact information and communication; project topics and assignments; good students in the project; project cooperation; project results and finally new innovations and goal for business continuity. The results are presented more in detail in Figure 27.

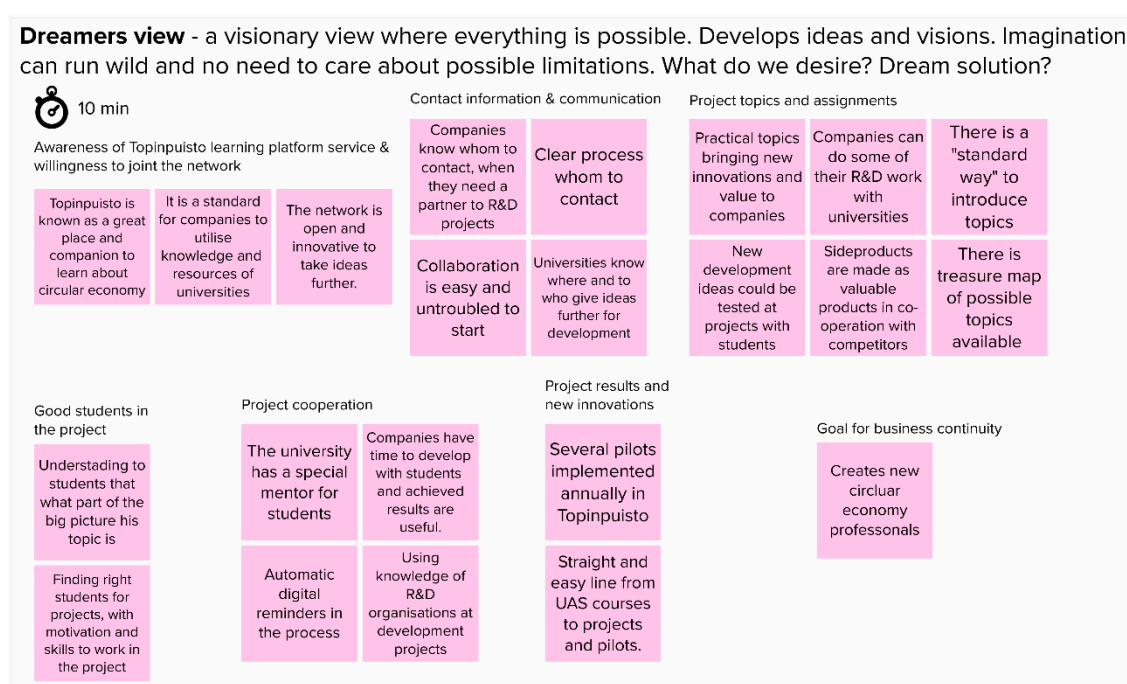


Figure 27. Dreamers view for cooperation and student projects.

General vision regarding awareness of Topinpuisto learning platform service and companies willingness to join the network, was that all universities in the area would know that Topinpuisto is a great companion to learn about circular economy; that companies in Topinpuisto would utilize the resources and knowledge of the universities; and that the network would be open and innovative to take generated ideas further. Contact information and communication highlighted the need of both parties to contact each other easily. Ideally, there would be a clear process for contacting parties and collaboration would be easy and untroubled to start. Projects or assignments should be practical and bring new innovations and value to the companies or side products of the

projects could be made as valuable products in cooperation with competitors. In addition, new development ideas could be tested at projects with students, there would be a treasure map of possible topics available and there would be a standardized way to introduce new issue or a project. Projects would have capable and motivated students who could benefit from the knowledge of research organizations as companies would have time to develop with students. Project results and new innovations would aim in having multiple pilots implemented in Topinpuisto annually together with companies and educational institutions. These pilots would strengthen business continuity and at the same time cooperation would create new circular economy professionals.

Realist view focused on reflecting the dreamers view and to be more realistic towards what kind of resources would be needed for optimal cooperation and project implementation or what kind of information needs to be agreed. The results reflect on agreeing project scope and purpose; contact information and responsibilities; project work and taking ownership for a project as well as sharing project results and future collaboration. These results are more in detail in Figure 28.

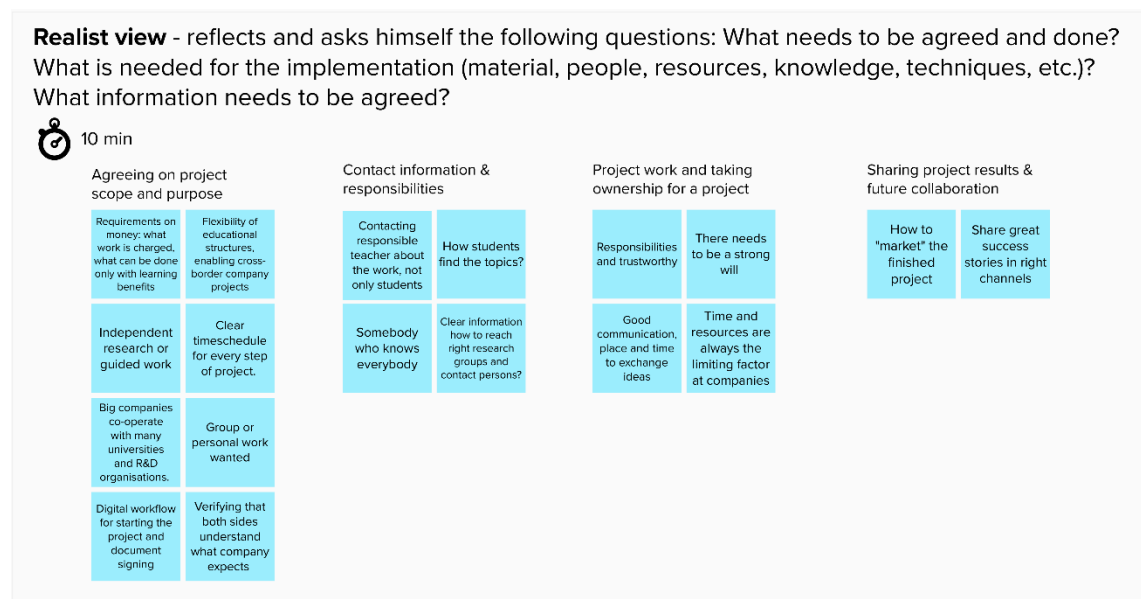


Figure 28. Realist view for cooperation and student projects.

Agreeing on project scope and purpose was raised as a topic that needs attention. The topic raised several very concrete aspects such as agreeing project form, schedule, expenses and expectations towards the project. It was seen important that all parties would understand what the companies expect from the project and that companies would know what type of project work is free of charge and what kind of work requires payment

transactions. The companies also brought up a point that they often cooperate with several universities and research organizations so they desire flexibility of educational structures, which would enable cross-border projects, exceeding the faculty borders. Regarding contact information and responsibilities, the stakeholders commented that communication channels should be clear to everyone and that having one contact person in each project group, who is familiar with all participants, would help the communication. Aspects towards project work and taking ownership for a project highlighted responsibility, strong will and trustworthiness as key factors for project success. As time and resources are always limiting factors at companies, this requires prioritization of projects and amount of resources needed for projects should neither be underestimated.

Critics view made stakeholders to look at the contradictions of the vision and realism and to point out improvement area, obstacles or risks concerning the cooperation. This view generated most comments and results are visible in Figure 29. The stakeholder comments could be grouped in eight categories, which are: project categorization and assignments; collaboration and communication; project process and starting the project; practical issues and safety; sharing project results; continuity for new topics; widening the cooperation with other schools and showcasing already done projects.

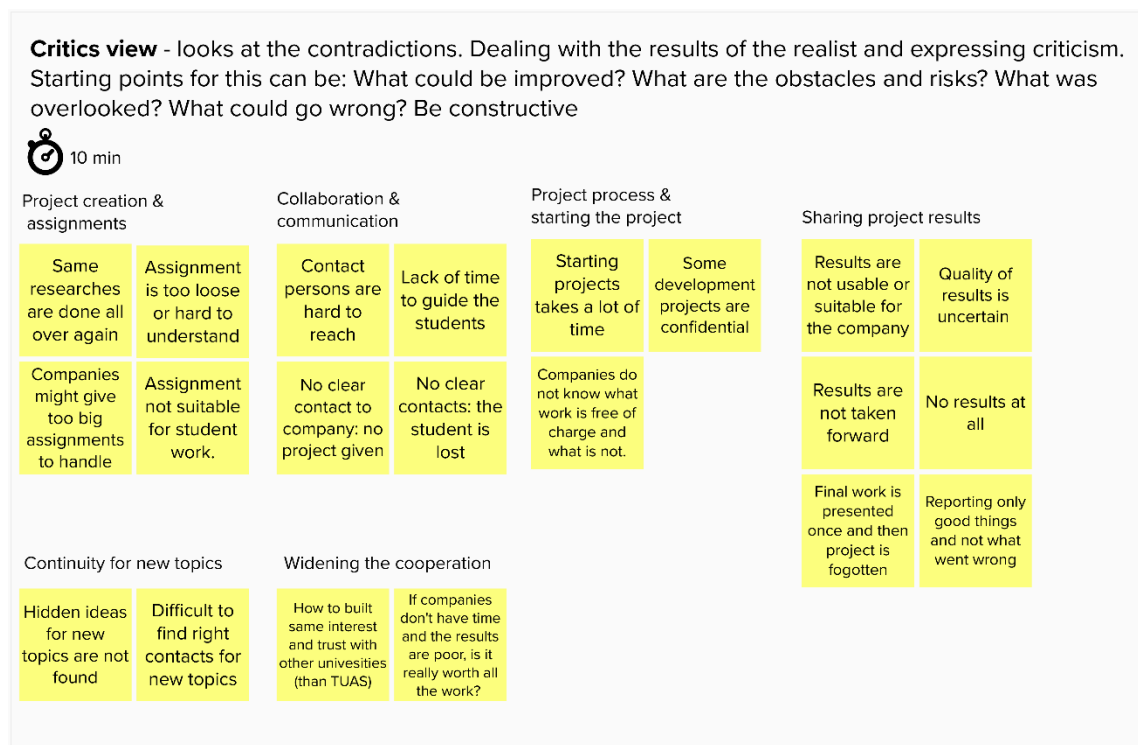


Figure 29. Critics view for cooperation and student projects.

Project creation, project work as well as communication and collaboration are categories, which already had been discussed in the previous views. The critics view raised concerns that assignments can be too loose, too big, too hard to understand, not suitable for student work or same research was done over and over again. Starting the project was seen too slow and companies were not aware of the costs of the project. Bad communication was recognized from all parties and it was stated that contact persons were hard to reach or clear contacts were not existing – this concerned both the companies and student groups. Several risks concerning project results were raised and main concerns were that the quality of results was uncertain or too low for any useful purpose or that there would be no results at all. However, lack of time in companies to guide the students was seen problematic as it correlates with the probability of reaching results in the project – if students do not get any help or advice from the companies, they are less likely to reach good results. Another concern was that results would not be taken forward or that the project would be forgotten after presenting the results.

The first assignment was ended with a closure discussion where gathered aspects were reviewed and discussed. As a summary from the assignment it was concluded that communication is important – both when agreeing a project and during the project. The learning platform should support this for example by supporting concept for agreeing projects and presenting contact points between companies and educational institutions via the platform. Another important aspect was having an understanding of project possibilities and dynamics. The topic touches resources and the discussion focused on how projects could be done as independent studies in the educational institutions or without a need to bind company resources. Furthermore, one topic was how to reach an understanding on the scope of the project or how big assignments could be given for students. Project support to students was also raised as a concern, which should be taken into account to ensure that students want to do projects within circular economy.

6.2.2 Task 2: Project categorization

The second topic in the workshop was about providing project categorization, under which projects could be categorized in the future. The proposal for project categorization was prepared based on the already done research projects for Topinpuisto, which is presented in chapter 2.3. Topinpuisto had done some further work with the project categorization and elaborated under each category which research topics the category

could contain or what type of problems could be researched in each category. This detailed categorization is presented in Figure 30 and was used for task 2.

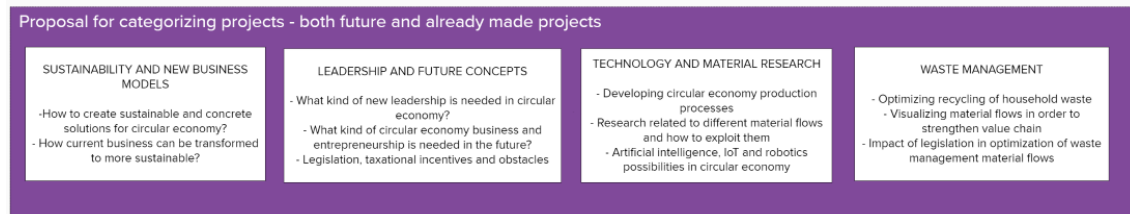


Figure 30. Detailed project categorization.

The chosen method for task 2 was six thinking hats, as it is suitable for exploring ideas but it also helps a design team to understand the effects of decisions from different viewpoints. The basic viewpoints are facts, desires and emotion, judgement, logical positive, creativity and alternatives as well as overview or process control. (Curedale 2013, 354.) Due to limited time, this method was also modified and only few hats were selected: the first aspect looked the categories from positive view and asked what are the benefits of the categorization and how does it serve the organization. The second aspect focused on the criticality and improvements by asking what are the drawbacks of these categories, what is missing and what alternatives there are. The assumption was that these aspects would bring out the most essential aspects from the categorization and thus answer the question if the categorization is usable and beneficial from the perspective of the stakeholders. The results of the task are presented in Figure 31.

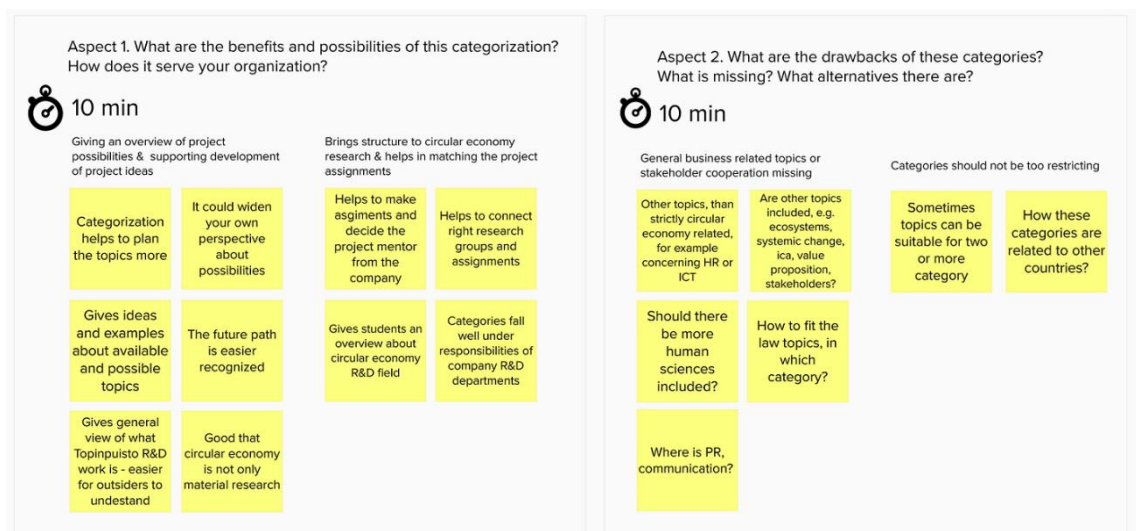


Figure 31. Benefits and drawbacks of project categorization.

Concerning benefits of categorization, the stakeholders recognized that categorization would give an overview of project possibilities and support development of project ideas. Categories would help to plan possible project topics and give ideas about available topics. Outsiders would easily see what Topinpuisto research and development work is about and categorization would demonstrate that circular economy is not only material research but offers other possibilities as well. Furthermore, it was seen that categorization would bring structure to circular economy research and help in matching project assignments. The stakeholders saw that the proposed categories fell well under the responsibilities of their own research and development units and thus would help in matching assignments and providing correct mentors for projects. When considering drawbacks of the categorization, the stakeholders pointed out that the categories should not be too restricting as there could be topics that would be suitable for two or more categories. In addition, they pointed out that general business related topics, such as human resources, public relations, law or information technology, were missing from the categorization.

6.3 Summarizing results

Analyzing all gathered data from the insight and ideation phases was done with an affinity diagram. Affinity diagram can be used to organize a large quantity of information by grouping them by natural relationships or themes. Organizing data helps to tame complexity, understand essential elements, and identify connections in the data and to create hierarchies. It also helps to identify themes and what factors needs to be focused on so that most value from the customer's perspective is created. (Weprin 2016.) The goal was to gather and group all the results in clear categories so that these could be used as a basis for prototyping and developing the service. Based on the analysis, the data was grouped under two themes: the first representing project cooperation and executing projects and the second representing the learning platform. Results of the analysis are presented in this chapter and prototyping was built based on these findings.

6.3.1 Project cooperation and executing projects

Results related to project cooperation between companies, schools and Topinpuisto as well as improvement ideas for executing projects are presented in Figure 32. The results

are divided in three categories: agreeing projects, project procedure and ensuring continuous flow for projects.

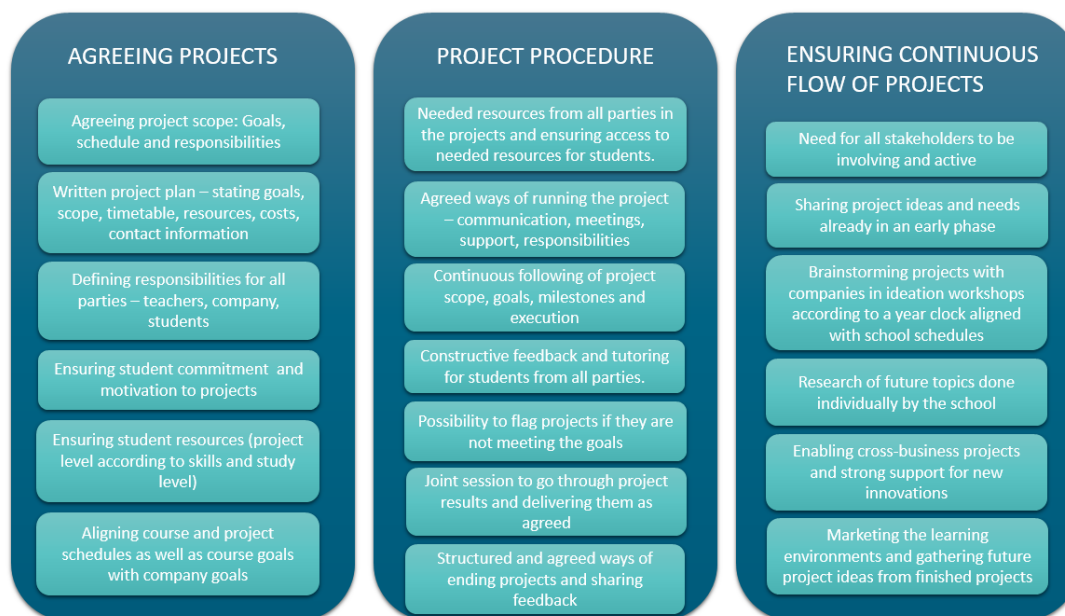


Figure 32. Project management improvements.

Results concerning project agreement highlight the need to agree project scope and provide a project plan, which should state the goals, scope, timetable, resources, possible costs and contact information of the project team members. In addition, school course and project goals should be aligned along with aligning the project schedules. Responsibilities should be defined to all parties – students, teachers and the company representatives. Concerning students, universities should ensure that project level is according to their study level and skills, and they should also ensure that students are committed and motivated to the project. By agreeing the projects scope and content already in an early phase and as accurate as possible, the project has good starting point to succeed and to meet the expectations of all parties.

During project execution phase, it would be essential to ensure needed resources from all parties for the project and ensure access to needed resources for students. There should be an agreed framework for running projects and continuous following of project execution to ensure that project scope and goals are met and that the project timetable and milestones are in line with each other. This generates also a possibility to flag projects if they are not meeting the goals. Continuous information sharing and constructive feedback support project execution for their part. A joint session to go

through project results and having structured ways for ending projects as well as sharing feedback provide a good framework to ensure that all parties are involved, they know how the results are processed and delivered, and that all parties have the possibility to share if their expectations were met. Engaging companies in the projects is essential, as it is a way to safeguard success of the projects and tackle the fear that they would waste time and resources to student projects with uncertain results.

Apart from project processing and procedure, an important element in the project cooperation and circular economy learning environment is also to ensure continuous flow of projects to keep up the value of circular economy learning environment for all stakeholders. Essential aspects of a functioning learning environment would be to keep all stakeholders involved and active, encourage cross-business projects and support innovations. Project ideas should be shared in an early phase and a good way to align company projects with school schedules would be to keep project topic ideation workshops with companies according to a set plan or a year clock. After each project, further development ideas should be gathered and stored in the platform for future purposes and to have a storage of project ideas waiting to be executed. Yet, marketing the learning environment remains crucial in growing the network and integrating more and more companies operating in the circular economy.

6.3.2 Learning platform

Results related to the learning platform are presented in Figure 33 and divided in four categories: purpose; assignment creation and project categories; user actions as well as future visions or other content. The current learning environment is an internet site presented in chapter 5.1.2. It was stated that the platform does not contain much information about the purpose of the service or how to engage it. Topinpuisto wishes to develop their learning platform and these results propose aspects or changes provided by users to be considered to the new learning platform.

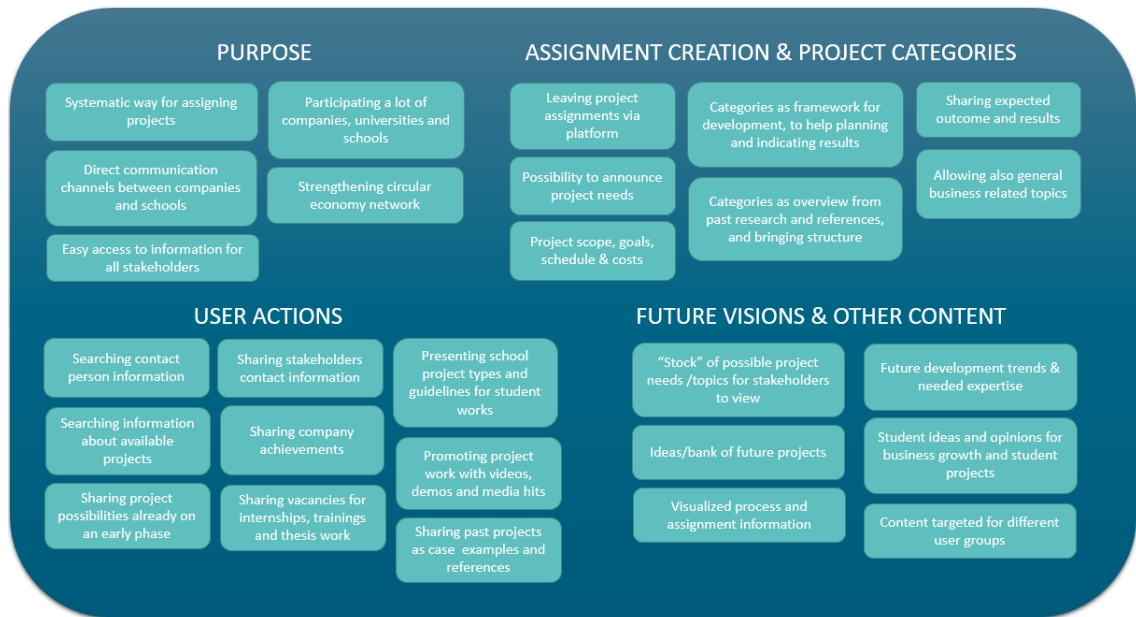


Figure 33. Learning platform elements.

Concerning the purpose of the learning platform, it should be emphasized that it is for a systematic way of assigning projects and a direct communication channel between companies and schools, also providing easy access to information for all stakeholders. The platform should aim to participate several companies and educational institutions, through which the circular economy network can be strengthened. With regard to project assignments, a functionality to leave project assignments is a must have. This would help in establishing direct contacts between companies and schools and provide visibility to project needs. Furthermore, it would help the administrative work of Topinpuisto in trying to match assignments and agree on project work. Announcing project need would be very convenient for educational institutions but entrepreneurs or small companies would also benefit from this. Project scope, goals, schedule and possible costs should be announced already when leaving an assignment, likewise to sharing expected outcome and results. These would help to scope the project and ensure that it is resourced with adequate students as well as to ensure that the project gains actual results that the company can use. The platform should contain already defined business categories for projects, which could work as frameworks for development, bring structure to the site but also help in planning projects or indicating results. However, categories should not be too restricting but an option for example for general business related topics should exist. Categories would be used on the learning platform to group already done projects and reference cases. This would make it easier for the user to find information

from the site and focus on the area that the user is interested in. These elements would help users to create and announce project ideas with some structure, which would make it easier for the schools to match projects and to know to which project ideas they could provide help or to which department the project could be placed.

Apart from leaving project ideas or announcing project needs, the research demonstrated other actions that the users would like to perform on the platform. Basic functions would be to search contact information or information about available projects. Users could share their own contact information and list project ideas or topics, which are not yet developed in to concrete project needs but something they see potential for further investigation. Benchmarking results also addressed that availability of contact information is more beneficial than a mere contact form. Company customers would like to share their achievements via the platform and use it as a channel to market their accomplishments and investments for better future and circular economy. They also could share open vacancies they have for internships, trainings and thesis work. University representatives could present the school project types and guidelines for different student works and what could be expected from them. This would help companies to understand what type of projects could be done and how large projects could be offered. During different projects, project members could promote project work with videos, demos or blog posts, to demonstrate cooperation and activities done in the field of circular economy. This was also very typical for other sites in the circular economy field providing cooperation with different stakeholders. In addition, past and successfully done projects should be shared in the learning platform as case examples and references for other people. Seeing concrete results received with student projects would work as an attraction to other companies to join the network and an encouragement for similar cooperation.

Future vision or other content provided in the platform considers the visual look and usability of the learning platform. The site should have a simple layout where different user groups are taken into account and it is easy for them to find information of their interest. In order to improve the usability for example processes or assignment information could be presented in a visual form. Regarding future visions, the platform could be a “stock” of possible project needs/topics that stakeholders could review. There could be a bank for future projects, meaning ideas discovered in student projects to take the circular economy research one step further from the basic material research. Topinpuisto could use the learning platform to highlight the future development trends

and needed expertise in the field of circular economy in the future. Specific research topic prospects could be promoted and highlighted already in advance, in order to awaken interest. Students could and should be participated on the learning platform and they could leave their ideas and opinions for business growth or projects topics that they could perform. After all, the essentials of the learning platform would be to gather all stakeholders from the circular economy field to this environment and bring them together in a way that would generate both discussion and development projects. This would advance circular economy field to flourish, generate something new and help in using the planet resources in a sustainable way.

7 DESIGN OF THE LEARNING ENVIRONMENT

The objective for this research was to examine the current Topinpuisto learning environment and user needs, and based on these, to develop the learning environment service. This chapter presents designing of the learning environment and developed prototypes. Prototyping was done in two parts: first concentrating on organizational improvements and second concentrating on the learning platform. Prototyping was based on research results and conclusions and it included few scheduled meetings with the commissioner representative Johanna Liipola, in order for the researchers to discuss if the presented designs were in line with the thinking of the organization.

7.1 Organizational improvements

Topinpuisto stakeholders desire a learning environment that could bring more innovations both in the companies and in the universities. The growing interest in university-companies relationship is based on collaborative research that can be a source of innovation and is critical to product development. In as much as this is desired, certain performance indicators are critical to successful collaboration, for instance, the amount of resources allocated by partners to collaboration; efficiency of collaboration management and clearly defined roles; as well as a number of company innovations resulting from collaboration with a university and new strategic partnerships. (Albats et. al. 2017.)

Organizational improvements focused on improving the backend processes and organizational operations of Topinpuisto. Goals of prototype building were to improve effectiveness of project cooperation and project work as well as to strengthen activities around Topinpuisto learning environment so that the stakeholder network could be strengthened. First, the researchers built a service blueprint, which took the user actions as a basis of the service and then considered the organizational activities around it. Second step was to build an organizational year clock for Topinpuisto so that by following the plan Topinpuisto could expand the circular economy network.

7.1.1 Service blueprint for Topinpuisto learning environment

Based on all insights gathered from users as well as analyzing the results, a service blueprint was built for Topinpuisto, to demonstrate the operation of learning environment in the future. This is presented in Figure 34. Service blueprint is a key tool researchers can use to redesign an existing pattern in which a particular system works. It is used to describe and get an overview of the frontstage and backstage employee processes as well as support processes. It describes the production process and provides information about the teams and roles participating in the service production as well as the systems, physical evidences, responsibilities and ways of working. These processes are linked to the customer experience and thus service blueprint can provide information to which steps the organization should focus on their activities. (Stickdorn et. al. 2018, 53.) By gathering user experiences and using that information to build a service blueprint for the learning environment, variety of important elements was brought up and these can be used to improve the service to function more optimally.

	Information phase		Agreeing on assignments		Project phase					Finishing projects	
Physical evidence		Learning environment, workshop location	Learning environment	Online meeting	Online meeting	Online meeting	Topinpuisto/ company area, school premises	Online meeting	Online meeting	Learning environment	Learning environment, Topinpuisto website
Company activities	Knowledge of learning platform and school cooperation	Project need/idea recognized	Creating project topic framework and goals	Contact established, project starting point agreed and project form selected. Align company and course goals.	Start of project: define scope, goals, criteria, schedule, costs. Sign contracts, agree confidentiality	Forming project team. Project plan with schedule, responsibilities and contact persons.	Co-development and insights. Active contacts and communication	Regular meetings, information exchange and feedback. Follow up on goals and execution.	Presenting project results and conclusions. Newsletters, blogs, videos, demos.	Sharing results and final report. Feedback, evaluation and project closure.	Business development and further development ideas
Teacher activities	Learning environment is familiar to teachers and students	Planning courses and needed projects	Frame of reference to researches and projects								New project ideas and further development topics. Company projects presented at schools.
Line of interaction	Topinpuisto employee actions onstage	Promoting the learning platform	Facilitating project planning and ideation workshop				Check up on the project progress			Participating in sharing results	Promoting the future and vision of circular economy
Line of visibility	Topinpuisto employee actions backstage	Creating newsletters, blogposts, participating events, contacting companies & schools.	Workshops to innovate project ideas with companies. Knowledge of school schedules	Surveillance that project ideas are shared in learning platform	Surveillance that assignments are matched in learning platform	Gather information about new projects starting		Coordinate publishing videos and demos to learning environment		Coordinate result sharing and company achievements to learning environment. Create reference cases.	Gathering library for future research topic. Promote cooperation and learning platform in blogposts, newsletters.
Support functions			IT support	Internet, e-mail, phone	Internet, e-mail, phone	Internet, e-mail, phone	Internet, e-mail, phone	Internet, e-mail, phone	IT Support, Internet, e-mail, phone	IT support	IT support

Figure 34. Service blueprint for Topinpuisto learning environment.

The service blueprint contains a combined customer journey to both company customers and universities as well as the onstage and backstage actions for Topinpuisto personnel, with a description of their responsibilities. The learning environment service was divided in four stages: the information phase, agreeing on assignments, project phase and

finishing projects. Presently, at the information stage, all stakeholders usually just contact known persons either in the company or in schools to deliberate and find out if there would be any cooperation possibilities. In the new service model, the physical contact point would henceforth be the learning platform. The learning platform is a website open to all companies on circular economy matters. It is a working tool for schools and companies in agreeing and assigning tasks effortlessly. On the platform, it is easy to find different project ideas, timetables, schedules, contact information and project cost if they are applicable, for a reasonable session or time. This will eliminate the ad hoc form in which projects come, it will also enable teachers build project contents into course outlines, and this will allow easy synergy when company and course goals are aligned. Topinpuisto major line of visibility is to promote the platform to the existing and new stakeholders, telling about the advantages that lie in engaging in the platform. This is achievable through participating in different company events where Topinpuisto representative could share some project success and probably show some demos to sensitize intending participants and give ideas of works that are doable. Presenting blogposts and newsletters or sharing information in social media would be other ways of marketing the learning platform. Topinpuisto presently organizes workshops to enhance cooperation, more of those workshops would still be ongoing so that participants can ideate more often and share project ideas. This would ensure that project planning would be aligned with university schedules and thus ensure the best situation for getting resources and projects successfully done. They should however ensure that project ideas are shared in the learning platform and that project agreements are matched with companies.

During the project phase, once a contact is established, the objective, scope and goals of the project are defined and responsibilities agreed, both parties can sign the contract. In all cooperation cases, Topinpuisto should be informed about the cooperation. Otherwise, there is no need for Topinpuisto to participate in the project but just to be informed about the project schedule, execution and realization of project goals. Active communication has been a major problem in this kind of cooperation, it is expected that the learning platform can bridge the gap where all partners are connected online regularly to co-develop themes and gain new insights from the works done by students. In addition, information exchange and constructive feedback is essential to attaining these goals.

At the finishing phase, there would be presentation of project result and sharing conclusions in a joint session with all project members. Project results could contain blogs, videos or demos about the research and development process and these could be published on the learning environment as references and case examples. Project ending would contain final delivery of the project report as well as evaluation and closing of the project. Topinpuisto representatives, once again, should be informed about the project results. Topinpuisto should coordinate that results of finished projects are presented at the learning platform, in the form of news, videos or blogposts. This is essential as it helps in gathering a library for the future research topics and ensures that further development ideas from the projects are stored for future purposes. This will eventually form an information pool and reference point for the existing and future users. The active part for Topinpuisto would be to promote the future research and vision of circular economy – through which the circular economy network is further strengthened.

7.1.2 Year clock for the Topinpuisto organization

After constructing the service blueprint, all the tasks related to learning environment to be managed by Topinpuisto organization were gathered and visualized in to a year clock. This is presented in Figure 35. Purpose of an organizational year clock is to support the Topinpuisto organization in performing needed actions whereas visual interpretation of the tasks keeps them easy to remember. When organizations have improvements plans and are not sensitive to articulate such plans, the risk is that plans are non-actualized. Year clock gives a general view of expectations and actions, which help Topinpuisto in achieving its aims. The year clock aims to help in maintaining focus, eliminating ad hoc projects and time constraints in executing projects if the guidelines are followed. (Hope et. al. 2011.)

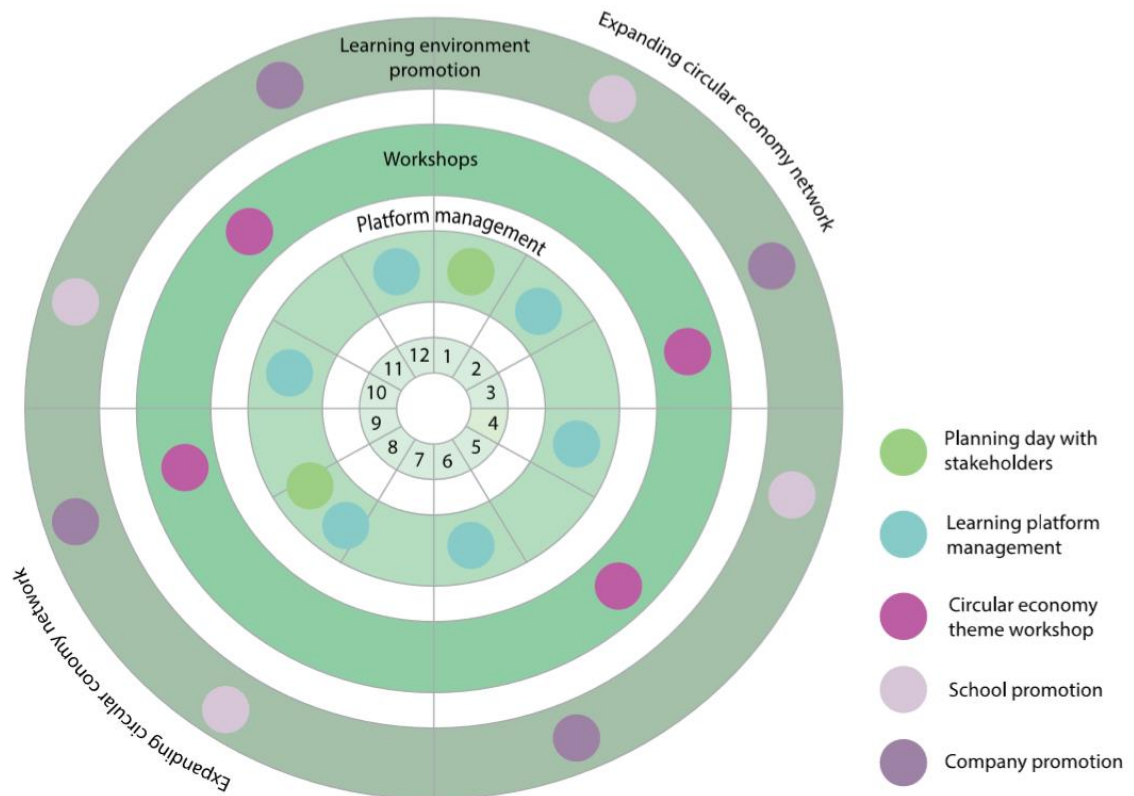


Figure 35. Year clock for the Topinpuisto organization.

The year clock has three levels of actions, representing platform management, workshops and learning environment promotion. Purpose of the learning platform management is to promote learning platform and project cooperation. Tasks contain project coordination of available and ongoing projects; coordinating content to the platform by creating or asking for newsletters, blogposts, videos, reference cases or reports from finished projects; as well as maintaining future development ideas. This is continuous job, which should take place at least bi-monthly, and is coordinated together with project contact persons, students or company representatives. Related to learning platform management, it is recommended that all stakeholders would hold a planning day or a retreat twice a year. The first could take place in January to consolidate plans and the second in August to see progress, review feedback and make amendments where necessary. The stakeholders consist of circular economy companies and organizations, both existing companies who already are partners with Topinpuisto and new companies who are aspiring to tap into the resources, as well as university teachers. Purpose of planning days would be to brainstorm and innovate project topics with companies and schools as well as to plan the coming year as what comes to upcoming courses and project needs. This would support both the work of teachers in planning the

upcoming curriculum and companies in planning their development projects, where student resources could be applied.

The second level of action is workshops, which aim to problem solving or brainstorming ideas related to a specific topic or project category. It could be held quarterly and with relevant stakeholders that are connected to the workshop topic. Specified topic and targeted participants would allow good relationships and collaboration amongst stakeholders and intending partners. One of the advantages of such workshops is the opportunity for all stakeholders to think about the future issues and make considerations in this regard. The basic theme is long-term thinking, identifying problems that are worth taking a longer perspective with or discussing future circular economy development trends or needed expertise in the future. Learning platform promotion, for one's part, aims to expand the cooperation to other companies as well as to strengthen the educational network. In order to achieve these goals, Topinpuisto should participate in regional entrepreneurship cooperation and participate in organizational events where it would have possibility to market the learning environment and promote it to other companies, municipal actors or other actors in the circular economy field. Strengthening the educational network would happen by contacting educational institutions or schools that are not yet part of the network, educating them about the cooperation and negotiating further cooperation. These activities could be scheduled to happen twice a quarter, which would be often enough to keep up with the activities related to achieving the goal but rarely enough so that these actions would not burden the organization.

7.2 Learning platform prototype

A good learning platform creates value to stakeholders, although stakeholders' values and objectives can differ in most cases when collaborating with an orientation of creating new ideas and knowledge on the side of the school and profit orientation for companies. Balancing these values determines the success of collaborations. (Albats et. al. 2017.) The aim of the project was to improve Topinpuisto learning platform and to develop an effective and efficient visual user interface for the learning platform, which would help users to efficiently match assignments and collaborate in the platform. Prototyping of learning platform was also done in two phases: First, building a moodboard and second, building an actual visualized prototype of the learning platform. This is presented in the

following chapters. All prototype pictures are presented in a larger size in Appendix 4 and the renewed prototype pictures are presented in Appendix 5.

7.2.1 Moodboard of the learning platform

As there were a lot of ideas and user aspects related to the learning platform, planning the prototyping was started with creating a moodboard. Moodboards are used in the inspirational phase of the design process, before the product takes its shape or official form. It is used to define the first guidelines of the product and the designer can use it as a tool to inspire the creative process. In moodboards designers can adapt both the information gathered during the research process and the lifestyle, ambiance as well as the atmosphere that the product will reflect. Moodboards represent the product style and they are used to bring concept from the imaginary to the tangible, before constructing the formal representation of the product. (Rieuf et. al. 2017, 44.) The moodboard for Topinpuisto learning platform is presented in Figure 36 and it was created to visualize the content and ideas what could be placed on the platform. It reflects the input given by users and the aspects that are important to them but it also incorporates visions of Topinpuisto from a circular economy network that is a showcase to the world and can present the way where circular economy cooperation should be taken. In the center of the picture is an idea of the learning platform and the central elements what it could contain. These are new assignments, exploring achievements, vacancies and project topics, reference cases, contact information and future visions. Pictures around the moodboard reflect the nature of project work between students and companies as well as the larger meaning of the Topinpuisto learning environment in development of circular economy and how it aims to help in developing circular economy or creating new business opportunities in the field of circular economy.

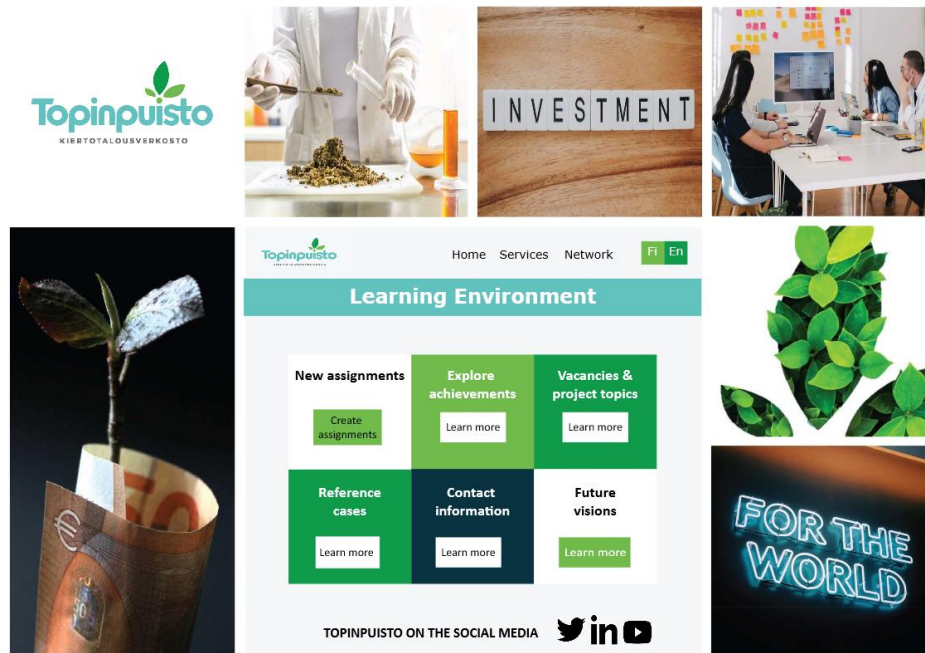


Figure 36. Moodboard of the learning platform.

Moodboards are used for example in the advertising industry and they can be used to develop concepts and communicate ideas to other people, informing the overall impression or result that the designer is aiming for (Pimlott-Wilson 2012). In this research, the moodboard was also shared with the commissioner and discussed on 30.6.2020. In the discussion, the researchers got confirmation that the ideas about planning and designing the learning platform were in line with the commissioner, and they also gained insights of the expectations that the commissioner had towards the prototyping.

7.2.2 Learning platform visualization

Building the platform prototype started with gathering all the relevant research results together, organizing the data and planning how the information would be organized in the platform. Designing the prototype started from deciding what would be the main elements or blocks of information and what each of these would contain. The approach or chosen design strategy was to create a prototype, which would look like the actual learning platform. It was agreed with the commissioner that the look and feel of Topinpuisto internet site would be used for the prototype so that would set the main theme, colors and components of the page. Otherwise, information and aspects gathered

during benchmarking were used in planning the prototype and all details concerning usability of the page were reviewed again. Service design process focused the research very much around the user aspect and needs and this user centered design was kept in the focus also when designing the prototype. In developing websites, the user experience and usability of sites has an important role. User centered design should evaluate if the site gives value to the user, if the user finds the site simple to use and navigate and if the user actually enjoys using the site. (Interaction Design Foundation 2020.) All these perspectives were kept in mind while building visualization of the prototype. First visualizations of the prototype were sketches, which formed a wireframe for the learning platform and the actual visualization was built based on these. Figure 37 presents sketches of the prototype.

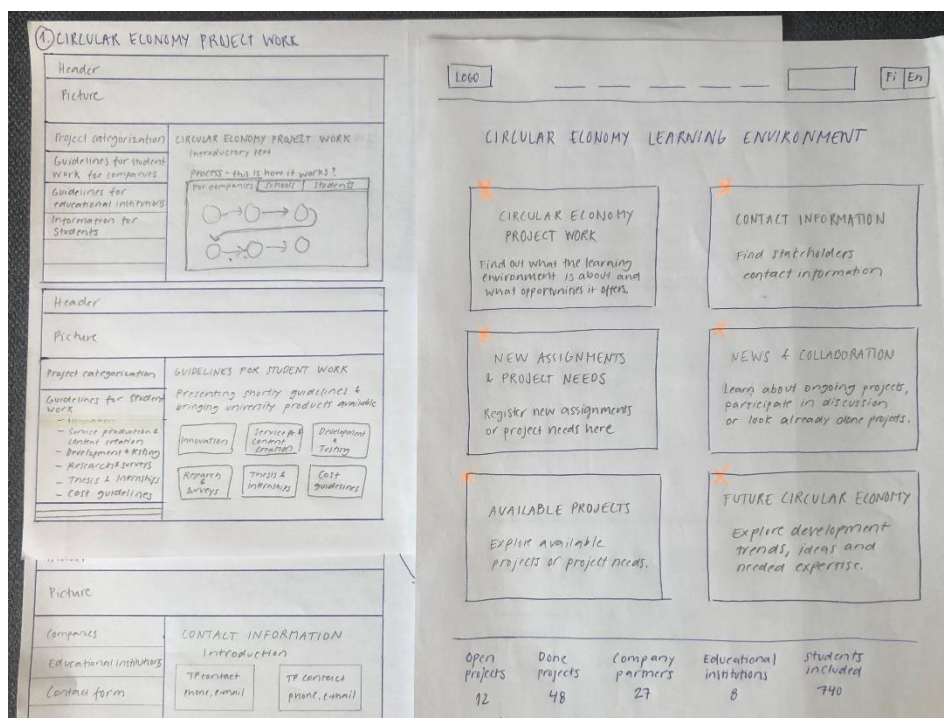


Figure 37. Learning platform sketches.

Usability of learning platforms depend on the perceived value and on the part of the users, perceived value is recognized as a factor of content, especially on the landing pages. Users can easily get attracted to a platform when information displayed on landing pages is informative and could already add value to the readers. Good landing pages should explain a product or service offering as well as emphasize its values. However, overcrowding information can be a disadvantage. (Dvir & Gafni 2018.) Landing page for

the Topinpuisto learning platform prototype is presented in Figure 38. The page was built around six blocks, which represent the most essential elements of the learning environment reflecting both the user needs and themes emphasized in the theory. The main blocks are circular economy project work; contact information; new assignments or project needs; news and collaboration; available projects as well as future circular economy. In addition, the page contains statistics about the amount of projects and stakeholders involved in the learning environment. The idea is to show the amount of open and done projects as well as number of companies, educational institutions and students involved in the cooperation. The following chapters' present visualizations of the main blocks and information gathered under each section. Overall, the layout of the prototype was kept simple so that the pages would not be overloaded with information but users would easily find the information they are looking for and would be able to navigate through the site easily.



Figure 38. Learning platform landing page.

Circular economy project work

Circular economy project work explains the purpose and goals of the project cooperation and provides basic information for all stakeholders – companies, educational institutions and students. This is the main block highlighting the service offering and emphasizing its values. Idea is that stakeholders would easily find all essential information about the

project cooperation under this title. The cooperation process would be presented in visual form and under separate headings stakeholders would find information essential especially to them. This type of approach tackles one problem experienced during benchmarking that it was difficult to find information targeted for different users. During the research process it also became evident that companies would like to have more information about the school products and the learning platform is a good place to present this. Thus, under information for companies, it would be optimal to provide information about different project types as well as practical details about projects. Visualizations of these are presented in Figure 39 and in Figure 40. Similar basic information should be presented to schools and students so that it would be easy to find how to engage into Topinpuisto learning environment and the cooperation.



Figure 39. Circular economy project work.

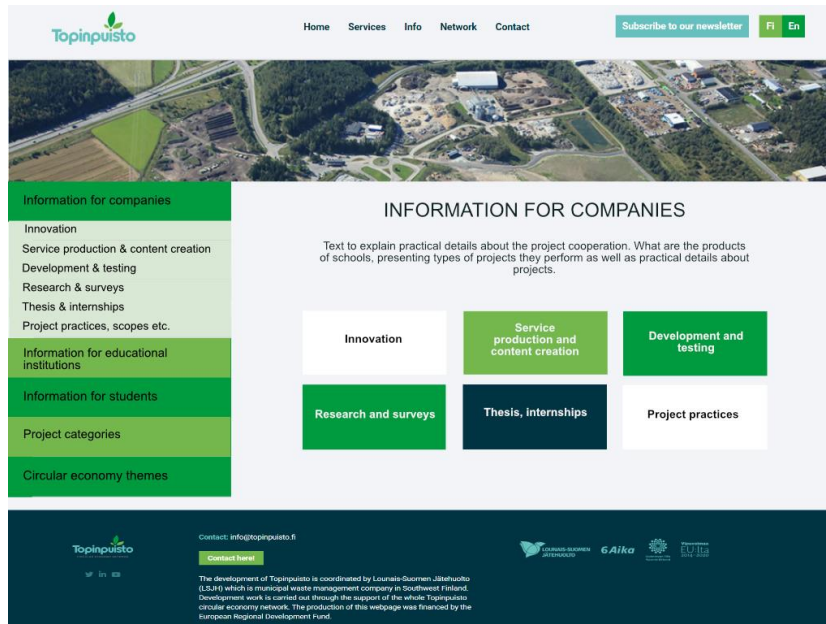


Figure 40. Information for companies.

As the Topinpuisto learning environment aims to systematically develop circular economy research and innovations, the circular economy themes and project categorization were applied to the platform. These are presented in Figure 41 and in Figure 42. Project categorization for Topinpuisto was prepared based on the already done student research projects and stakeholders also saw the categorization suitable for the current research purposes, helping to bring structure to project grouping under certain circular economy themes. Categorization was reviewed during ideation workshop and as a result the prototype has five categories: sustainability and new business models; leadership and future concepts; technologies and material research; waste management as well as other business development. The last category was added based on feedback received from internal and connected stakeholders in the ideation workshop and it can be used for topics, which do not directly fall under circular economy themes but are relevant for developing organizations. Circular economy themes, for one's part, bring the global level approaches as part of the learning platform. As explained in the theory, circular economy has been divided under five themes, which represent circular economy options and business models. These models are applied on the global level and in Finland, Sitra has adopted these. Thus, the learning platform presents as well products as a service, sharing platform, resource efficiency and recycling, product life extension as well as renewability. Introduction of these themes

may help stakeholders in adopting new possibilities or in finding new business options. In addition, research and project topics can also be ideated based on these themes.

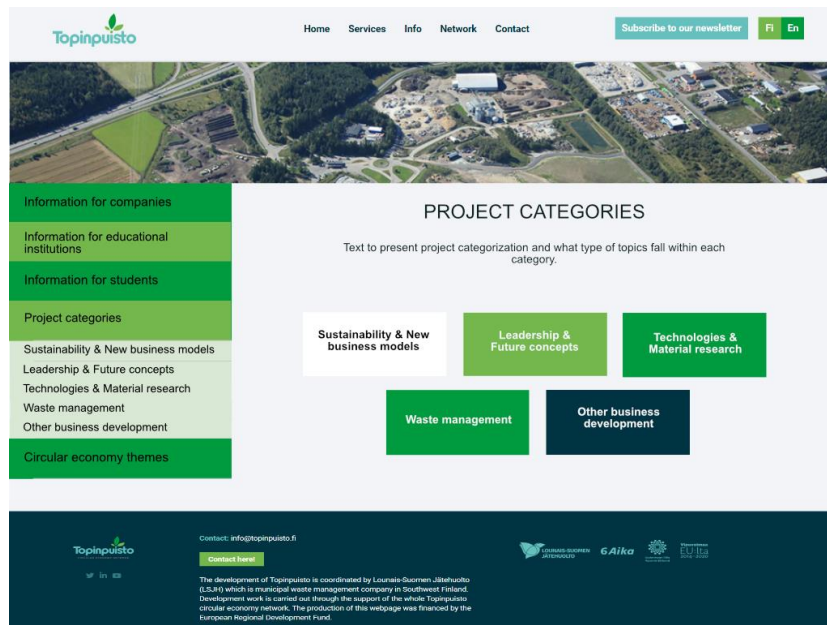


Figure 41. Project categories.

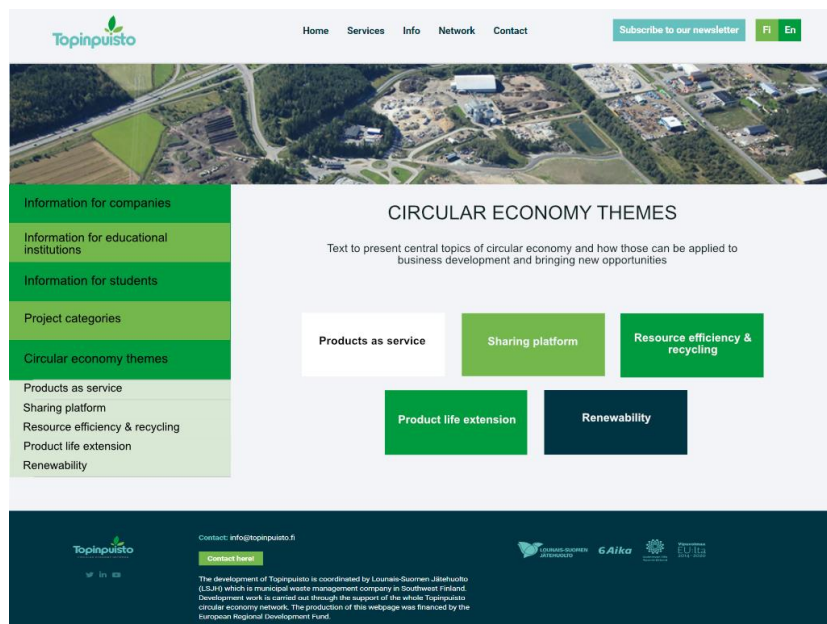


Figure 42. Circular economy themes.

Contact information

Contact information section is presented in Figure 43. When entering the section, the visitor would immediately see contact details for Topinpuisto personnel: name, phone number and e-mail so that contacting the responsible party would be as easy as possible. Benchmarking showed that presenting contact person information is widely applied and thus this approach is recommended. Furthermore, from the user perspective, having direct contact person information available is convenient. As Topinpuisto learning environment consists of stakeholder network, it would be important to include this contact information as part of the learning platform and present contact details for network companies and educational institutions. Because maintaining contact information can be time consuming and challenging, the platform could contain links to the corresponding company or school sites. The contact form, through which representatives could leave a contact requests, was also left to the prototype.

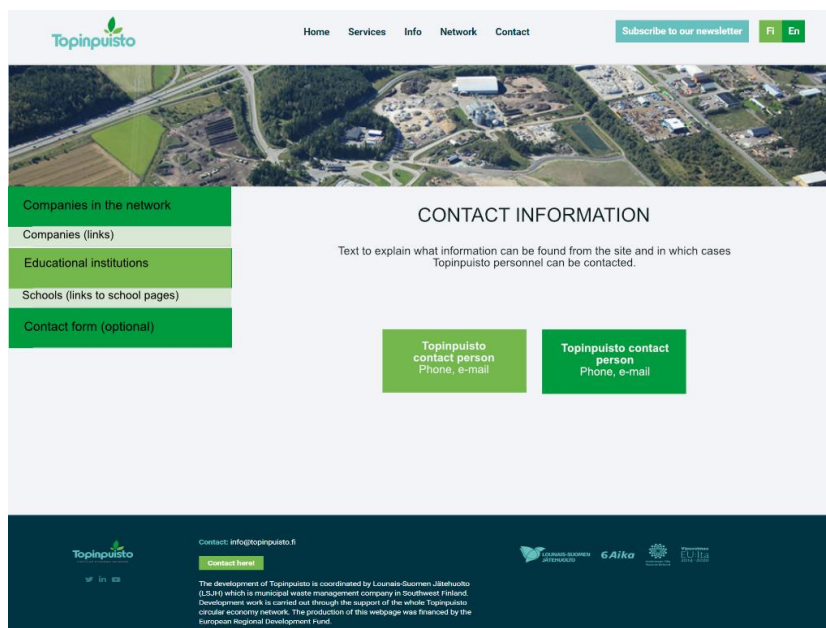


Figure 43. Contact information.

New assignments or project needs

New assignments and project needs is presented in Figure 44. This block forms one of the most relevant parts, which helps Topinpuisto organization in their service delivery and enables more efficient assignment creation and matching. Purpose of the block is to

enable access for stakeholders to create project assignments if they have commissions to offer. Furthermore, stakeholders could also announce project needs under this block. For example, educational institutions could announce project commissions for students via the platform. Managing assignments would be possible for registered users.

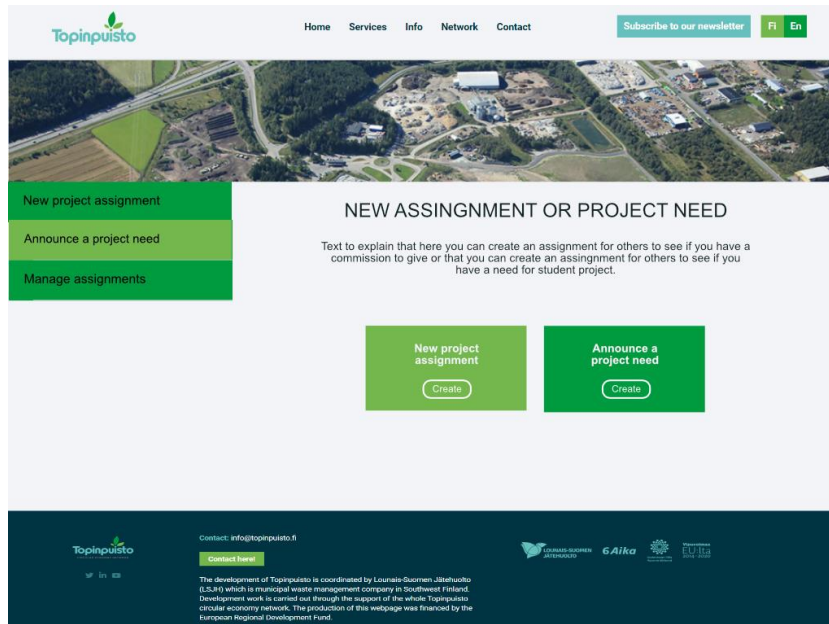


Figure 44. New assignments or project needs.

The forms for creating project assignments or project needs were also drafted for the prototype and these are presented in Figure 45. As the research results show, stakeholders felt important that enough information would be shared already from the beginning of the project and this point was taken into consideration when creating the forms. Both forms contain basic information regarding project, such as stakeholder name, contact person information, project description, project schedule as well as number or project participants. In addition, some additional information is needed such as expectations from the project, required skills from students, level of supervision or information about costs or funding. The stakeholders also have a possibility to share attachments with more detailed information about the project. Some information has been defined as compulsory and this information is publicly shown. The reason for this is to guarantee that all assignments would have minimum amount of information available for other stakeholders. Some information was left as optional because companies may not know that in the early phase of the assignment and this should not stop the process. It was also decided to leave the optional information as hidden so that it would be visible only for Topinpuisto personnel. This way the companies or educational

institutions could include more accurate information about the project but sharing that information would be controlled. Topinpuisto could then share this information to the parties that are interested of this specific information.

The image displays two side-by-side screenshots of the Topinpuisto website's project assignment forms. Both forms feature a navigation bar at the top with links for Home, Services, Info, Network, and Contact, along with a 'Subscribe to our newsletter' button and language options (FI, EN).

The left form, titled 'AVAILABLE PROJECT ASSIGNMENT', includes the following fields:

- Company's name *
- Project contact person information *
- Project description *
- Project expectations *
- Level of supervision
- Number of project participants & required skills
- Project duration and schedule *
- Company funding available (Yes No)
- Thesis or internship possibility (Yes No)
- Attachment

The right form, titled 'PROJECT NEED', includes the following fields:

- University name *
- Field of study *
- Project contact person information *
- Project description *
- Project expectations *
- Number of project participants & study level *
- Project duration and schedule *
- Fees applicable (Yes No)
- Attachment

Both forms include a disclaimer at the bottom: 'All fields marked with * are compulsory and shown publicly on the website. Other information is additional and shown only for Topinpuisto personnel.'

Figure 45. Project assignment forms.

Available projects and project needs

Assignment forms have a direct link to the fourth block on the platform, which was about available projects and project needs, presented in Figure 46. This block is important as it offers platform users direct visibility to the offering of available projects or project needs. Platform users could search or filter available projects based on their needs and interests. Students and teachers could search for available projects and companies could look what type of projects educational institutions are looking for. Users could also filter information based on project type, for example thesis, internships or student research work. Each project assignment would contain the same amount of basic information given in the assignment form. In addition, stakeholders could directly contact each other in case they are interested of a certain project or would have a project to offer. As brought up in the year-clock, Topinpuisto would still need to organize and monitor

assignments but enabling direct contacting would enable more efficient assignment matching between stakeholders and relieve the pressure from Topinpuisto for matching assignments. The block would also provide students visibility to project assignments, helping them to find interesting work opportunities.

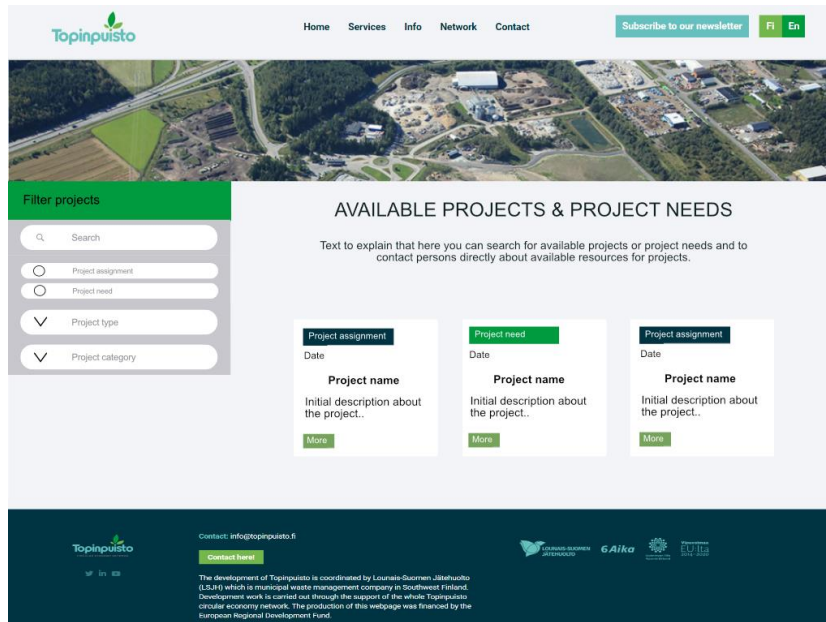


Figure 46. Available projects and project needs.

News and collaboration

The fifth block was news and collaboration and it is presented in Figure 47. The block is an essential part of modern and contemporary learning platforms, which should aim to participate stakeholders, enable discussions and change of information between participants. A central part of the block would be a news section, where project participants, company or school representatives or students could share and post news related to circular economy project work. Users could create content related to project work and results. The block would support several formats and users could post for example newsletters, videos or blogposts. Page visitors could search or filter news and they could contribute to the content by participating in discussions or leaving their thoughts and ideas. Thus the block would enable communication and collaboration between circular economy stakeholders and would serve as a forum for sharing ideas or perspectives. This means that circular economy knowledge could also be socially built by users sharing both expertise and collective experiences.

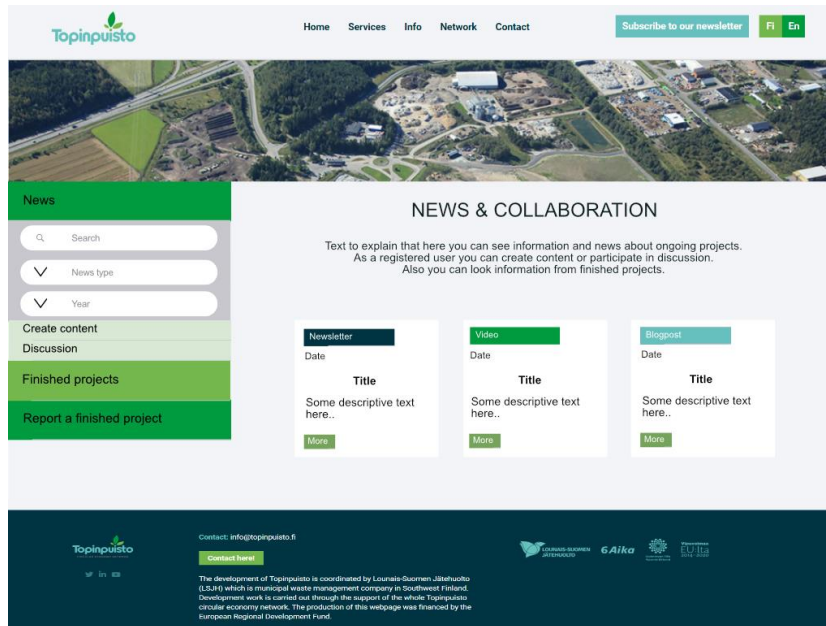


Figure 47. News and collaboration.

In addition to news section, all the finished projects would be presented under news and collaboration block. The page would have a section for project representatives to report a finished project. The project representative should also report project type (for example thesis, research, innovation), describe shortly the project aims and results and provide a link to the project report or results. In this phase, at the latest, the projects would also be categorized under Topinpuisto project categorization. After reporting a finished project, these would be viewable for the platform users, who could search projects by project type or category, project name or by year. These are presented in Figure 48 and in Figure 49.

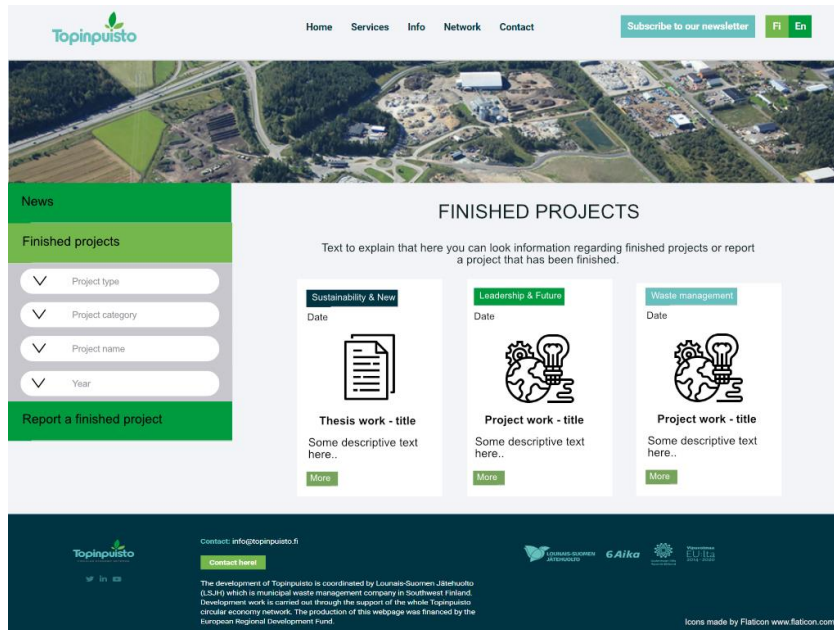


Figure 48. Finished projects.

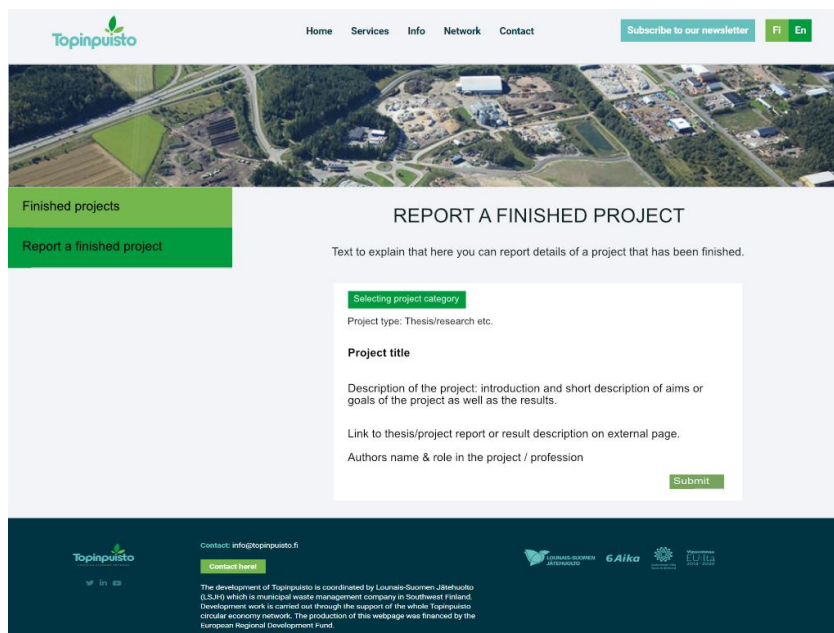


Figure 49. Reporting a finished project.

Future circular economy

Sixth and last block for the learning platform is about the future circular economy, presented in Figure 50. This block was seen essential as circular economy is constantly changing and evolving. The theoretical approach demonstrates that there is no one

development trend for circular economy but several different paths that keep moving and have an influence on the future actions. Thus, the learning platform could be a place where awareness of the future and future development trends could be highlighted and presented. The platform should present various aspects and have links to articles that discuss the future possibilities or needed expertise in the future. In addition, the platform could operate as a platform to collect ideas for future project topics. According to the nature of modern online platforms, the stakeholders would be able to create and contribute to the content by posting and looking for ideas as well as by discussing these with other stakeholders. During research, it became evident that almost all projects come up with results that could work as future development ideas or research topics, and these ideas could be gathered under Topinpuisto platform. Other users could familiarize with these topics and they could be worked with other project groups. By allowing discussion about global trends and future development, Topinpuisto would contribute to the future circular economy by providing information, ideas and perspective about the future needs. This, for one's part, could strengthen cooperation in the circular economy field as well as awake awareness and discussion among stakeholders and make them to take further steps.

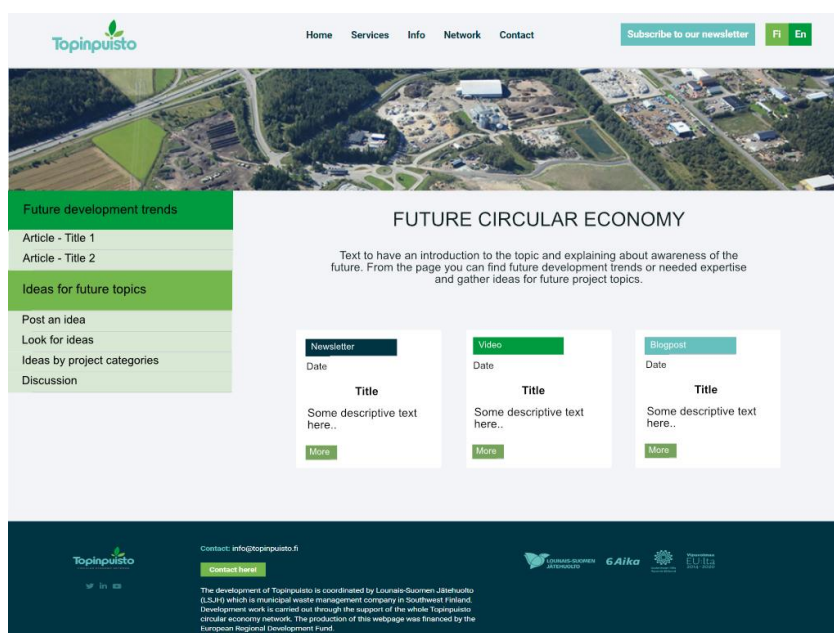


Figure 50. Future circular economy.

On the whole, the prototype of the learning platform aimed to take the needs of stakeholders in to consideration. This was done by gathering user experiences with an extensive research and by participating users in the ideation process. These aspects

were then incorporated to the learning platform. For Topinpuisto organization, enabling assignment matching was an essential element and thus it was crucial that the platform would have possibility for creating assignments and for users to look for assignments and contact responsible parties directly. In addition, needs of companies and educational institutions were considered when creating the project assignment form and having as much information as possible already when agreeing about the project, as this was seen important for the success of the project. Another goal was to provide adequate amount of relevant information for all stakeholders. Especially companies wished more information about the project cooperation or school products and this was also enabled. Furthermore, the site would offer information about the cooperation also to educational institutions and students. Sharing contact information is essential for establishing direct contacts between parties or conveniently contacting Topinpuisto. Companies' motivation to showcase their results and achievements were enabled with the news and collaboration section, which represents modern collaborative platform. Goal would be to share information and results of all projects done within the Topinpuisto circular economy network. Information would be more structured and there would be more organized approach for categorizing research results and connecting that to the circular economy themes and focus areas, considering also the future of circular economy and emerging development trends.

7.2.3 Refining the platform prototype

After drafting the learning platform prototype, it was presented to the commissioner representatives on 27.8.2020. In the meeting each block of the prototype was reviewed and discussed allowing the commissioner representatives to give their opinions. Several relevant points were made during the meeting, also resulting to changes. For the most part, the prototype remained as presented in the previous chapter and for example blocks for circular economy project work, contact information, registering project assignments or needs and reviewing available projects remained as drafted. Changes were made to the news and collaboration block as well as future circular economy block. Reasons behind these changes were based on the resources as well as the technical and operational readiness of Topinpuisto organization.

Regarding news and collaboration, it was decided that news section would be merged with the main news section on the Topinpuisto internet page. Thus learning environment

project work would not have its own news section but these news could be posted under other news concerning Topinpuisto. Therefore the only section remaining under news and collaboration would be information about finished projects and reporting projects. The name of the block was also changed as finished projects. Concerning future circular economy maintaining information about the future development trends and needed expertise was also seen demanding and there was a need to lighten this section. Instead of having an open forum for sharing ideas and discussing about future development trends it was seen more beneficial at this point to have a place where stakeholders could submit their ideas about development projects, research topics or practices concerning Topinpuisto or circular economy. This was modified to the prototype and it is presented in Figure 51. It was discussed that Topinpuisto could regularly process these ideas and give insights to the ideas they have received or use these as topics or material for workshops or stakeholder meetings. This type of approach would serve better the needs of Topinpuisto organization and match with their organizational capabilities.

The image shows a web page for Topinpuisto with a 'GIVE US YOUR IDEAS' section. The page has a header with the Topinpuisto logo, navigation links (Home, Services, Info, Network, Contact), and a newsletter subscription button. Below the header is an aerial photograph of a residential area. A green button labeled 'Leave your idea' is on the left. The main heading is 'GIVE US YOUR IDEAS'. Below it is a paragraph: 'Text to have an introduction to the topic and that via this page you can submit your ideas for cooperation or development projects, research topics etc. All stakeholders are welcome to leave their ideas. Topinpuisto will regularly process ideas and give an insight to the ideas they have received.' A form box contains a dropdown menu 'Select category for idea', a 'Title: Project idea' field, a 'Description about the idea or topic:' field, a 'Contact information (optional)' field, and a 'Submit' button. The footer includes the Topinpuisto logo, contact email 'info@topinpuisto.fi', a 'Contact here' button, and logos for Lounais-Suomen Jätehuolto, Aika, and the European Regional Development Fund. A small text block in the footer states: 'The development of Topinpuisto is coordinated by Lounais-Suomen Jätehuolto (LSJ) which is municipal waste management company in Southwest Finland. Development work is carried out through the support of the whole Topinpuisto circular economy network. The production of this webpage was financed by the European Regional Development Fund.'

Figure 51. Modified future circular economy block.

8 CONCLUSIONS

This research focused on developing Topinpuisto learning environment and especially their learning platform. The aim of the research was to improve the Topinpuisto learning platform and its existing backend processes. The research objective was to examine the current Topinpuisto service delivery process and needs of users, and based on these develop the learning environment service. Goal was to create an effective and efficient visual user interface for the learning platform, which would reflect user needs and aspirations as well as help users to efficiently collaborate in the platform. Another goal was to provide Topinpuisto a structured view for the learning environment service, through which they would be able to develop their backend processes. The main research question for the thesis was: What kind of a learning platform is suitable for Topinpuisto's stakeholders and helps to improve Topinpuisto processes? That is answered further in this chapter.

Topinpuisto learning environment was researched in the framework of circular economy and learning platforms. The research project adopted a double diamond model and was divided in four steps: research, insight, ideation and prototyping. Theoretical focus was on explaining circular economy from the global level to grassroots and providing an outlook for the future. Theory also explained the importance of using educational institutions as driving force for circular economy and current trends and features on learning platforms. Goals of the research phase were both to discover essentials of the Topinpuisto learning environment and to understand how other organizations have built similar services. In reaching the first goal, the research phase contained building a stakeholder map and doing a desk research of previous student projects. For the latter goal a benchmarking of several learning platforms, both from Finland and abroad, was done. Insight phase focused on identifying service users and the goal was to understand who the service users are, to gather user experiences and to understand the needs and expectations of service users. This was done by organizing semi-structured interviews and interviewing the main stakeholders – representatives from circular economy network companies and universities. Information gathered from the interviews was used to build personas and customer journey maps. Ideation phase leaned already towards prototyping and goal was to develop both the learning platform as well as Topinpuisto back-end processes. This was done with value proposition canvases, brainstorming and organizing an ideation workshop with stakeholders. The ideation phase focused on

defining what kind of functionalities were needed in the learning platform user interface or how learning environment cooperation could be developed in to a more structured direction. Prototyping phase focused on designing the service improvements and it contained solutions for Topinpuisto organization and the learning platform. A service blueprint and a year clock were built for Topinpuisto to demonstrate organizational improvements and a new, visual, solution for the learning platform was designed to represent a renewed user interface for the learning platform. The learning platform design was also reviewed with the commissioner and some changes were applied to the design based on the feedback.

What kind of a learning platform is suitable for Topinpuisto stakeholders and helps to improve processes of Topinpuisto?

Starting point for the research was that the current learning platform is part of Topinpuisto web page but contains only introduction text and a contact form through which interested stakeholders can contact Topinpuisto. Thus, all the work related to student projects or matching assignments was done by Topinpuisto organization. With scarce resources, it was demanding to work as an intermediary between companies and educational institutions and meet their expectations, and at the same time try to expand the circular economy network. Current challenges demonstrated a need to redesign the learning platform in a manner that could accommodate more information and be easily accessed by all collaborators.

Companies belonging in the circular economy network and educational institutions participating in the project cooperation were identified as the main stakeholders of the Topinpuisto learning environment and this research focused on their needs. Circular economy students were recognized as stakeholders as well but they were out scoped in order to keep the research scope focused. The research demonstrated that these stakeholders share some needs regarding the learning platform but they also have differing needs. Common needs for all were that the learning platform should provide easy access for information for all stakeholders, it should contain basic information regarding the learning environment cooperation and provide an overview for stakeholders what the project cooperation can offer and in which fields' cooperation can be done. In addition, possibility to announce projects and project needs was found relevant, and stakeholders stated that leaving assignments and searching information should be easy and straightforward. In general, the platform should contain accurate information, which is up to date, and functioning links to other information. Only then,

when users can easily find relevant information and proceed with the actions they are looking for, the platform serves the needs of the users and provides a pleasant user experience.

Company customers found it essential that the platform would be an avenue through which they could present their works to the larger society and share their achievements. This was fulfilled through the news and collaboration section, where stakeholders could promote project work and share achievements for example with videos, demos or blog posts. News could be published at any stage of the project and companies could also share information about past projects, case examples or reference cases. Another important element for the companies was to find information about the project work and its possibilities as well as to agree project scope, goals, schedule, costs or responsibilities as early as possible. Through the learning platform, these could now be defined already when leaving a project assignment. Agreeing the framework for projects as early as possible would help in clarifying the expected outcome and project results.

Educational institutions, for their part, found it most suitable to share project needs and search project possibilities via the learning platform. Their aspiration was that companies would share project possibilities as early as possible so that these needs could be developed together and universities could respond to the expectations of the companies. When companies would share project possibilities or open vacancies for thesis work or internship, educational institutions could help students in finding these opportunities. The opportunities would benefit both parties – companies would gain resources and business development work with small investments and students would gain work experience and contacts for future possibilities. Furthermore, educational institutions valued the availability of contact information, which would enable direct contacts to companies for further discussion and continuation of available projects.

Regarding Topinpuisto, the research showed that Topinpuisto would benefit from systematic way for assigning projects, which the learning platform could offer. Via the learning platform Topinpuisto could visualize the project cooperation process and have content targeted for different user groups. This way information about the learning environment cooperation would be available and easily accessible for all stakeholders, which would reduce the need for contacting Topinpuisto and asking for basic information. Another important element beneficiary for Topinpuisto would be coordinating project assignments via the learning platform. Having a form for assignments would help in gathering basic information and details for assignments, which are needed for further

planning of the project work. This would create a more structured approach for projects and diminish the need for gathering information with sending e-mails. Announcing project assignments directly on the learning platform would bring assignment information visible for all stakeholders and would enable direct communication between companies and schools or companies and students. This would diminish the pressure from Topinpuisto organization in matching assignments as all stakeholders could directly access information. Topinpuisto could focus on surveillance of project assignments and help in matching projects, in cases where assignments are not matched by the parties themselves. Furthermore, categorizing student projects would help in creating a more systematic approach for project work. Project categories would work as frameworks for development, help in planning new projects and indicating results. They would also give an overview of the past research and references, and bring structure both to the learning environment and categorization of information on the learning platform.

Another aspect gained from the research was that Topinpuisto should involve stakeholders and make them active in planning the work. When Topinpuisto is able to gather stakeholders together for example to brainstorm possible project topics or to develop further project ideas gathered from finished projects, this would enable continuation of project cooperation between companies and educational institutions. These stakeholders could individually continue with project topics, without the need of Topinpuisto to work as an intermediary party in between. This would further release Topinpuisto resources for example for promoting the learning environment and the platform or for concentrating on expanding the circular economy network and participating more companies or educational institutions in the learning environment.

Further development

This research has studied the Topinpuisto learning platform from the perspective of selected stakeholders, namely Topinpuisto organization, circular economy network companies as well as the educational institutions. The research designed the first version of the Topinpuisto learning platform to be implemented. When the platform is developed and in use, that will offer several topics for further studies, from which stakeholders or companies perception about the learning platform would be a logical continuum for this research. Further studies could look into how comfortable companies and educational institutions are in using the platform. This would be relevant especially in terms of privacy

of the company or having confidence that other companies would not misuse the information shared on the learning platform, as it is now an aggregation point for all companies.

Student perspective was limited out from the research and therefore it offers another opportunity for further studies. Designing customer journey map for students on the learning platform would visualize the process from their perspective and provide information about the pain points they experience but also the areas of interest or information needed for studies. Further research could also explore students' personalities in terms of their background, personality types, exposure and experiences as regards to the usage of the learning platform. Students also have a key role in performing the projects for companies and focusing on them would provide information about the actual project cooperation and further pain points. All this information could be used in developing both the learning environment and the learning platform.

Development of the learning environment offers topics for further development also regarding Topinpuisto organization. This research advised that Topinpuisto could attend different types of company events or networks with different actors in order to create awareness of the learning environment. It could be studied further that what other avenues or channels could be used to promote learning platform or to expand the circular economy network. Further research could also examine possibilities how Topinpuisto could create revenue via the learning environment and learning platform, and thus motivate the organization to continue development of the learning environment. Furthermore, another development aspect relates to the future of circular economy and the different scenarios the future has. As there is no one clear future for circular economy but alternative scenarios, which depend on alternatives selected by different actors, one research topic could be to focus on what areas or topics should be focus areas for Topinpuisto and if this kind of approach should be pursued by Topinpuisto. This research proposed one approach to categorize information and approach circular economy, but as the circular economy is evolving, so should Topinpuisto.

REFERENCES

- About Topinpuisto 2020. In <https://www.topinpuisto.fi/en/info-2/>. Accessed 26.2.2020.
- Albats, E.; Fiegenbaum, I. & Cunningham, J. 2017. A micro level study of university industry collaborative lifecycle key performance indicators. *The Journal of Technology Transfer*, Vol. 43, pp. 389-431 (2018). Available at <https://link.springer.com/article/10.1007/s10961-017-9555-2>. Accessed 12.11.2020.
- Aubertin, C. 2019. From Product to Product-as-a-Service. (Blog Post). *The Start Up* 2.7.2019. Available at <https://medium.com/swlh/from-product-to-product-as-a-service-37baed471cd6>. Accessed 13.08.2020.
- Ballarano, A.; Colace, F.; de Santo, M. & Greco, L. 2016. "The Postman Always Rings Twice": Evaluating E-Learning Platform a Decade Later. *International Journal of Emerging Technologies in Learning*, Vol. 11(2), pp. 35–42. Available at <http://dx.doi.org/10.3991/ijet.v11i02.5030>. Accessed 15.8.2020.
- Barnosky, A.D., Ehrlich, P.R. & Hadly, E.A. 2016. Avoiding collapse: Grand challenges for science and society to solve by 2050. *Elementa science of the Anthropocene*, Vol. 4, p.000094. Available at <https://doi.org/10.12952/journal.elementa.000094>. Accessed 06.07.2020.
- Carrington, D. 2020. Microplastic particles now discoverable in human organs. *The Guardian* 17.8.2020. Available at <https://www.theguardian.com/environment/2020/aug/17/microplastic-particles-discovered-in-human-organs>. Accessed 07.08.2020.
- Circular Turku. 2017. Operationalising regional circularity: Best practices from Turku. Increasing the circularity ambitions of regional waste management with Lounais-Suomen Jätehuolto Oy. Available at https://www.turku.fi/sites/default/files/atoms/files/circular_turku_-_case_study_2.pdf. Accessed 15.08.2020.
- Cornejo-Velazquez, E.; Clavel-Maqueda, M.; Perez-Lopez-Portillo, H. & Luybimova, E. 2020. Business Model of Learning Platforms in Sharing Economy. *Electronic Journal of E-Learning*, Vol. 18(1), pp. 102–113. Available at https://issuu.com/academic-conferences.org/docs/ejel-volume18-issue1-article696?mode=a_p. Accessed 15.8.2020.
- Curedale, R. 2013. *Design thinking: process and methods manual*. Topanga, CA: Design Community College Inc.
- Curtis, S. & Mont, O. 2020. Sharing economy business models for sustainability. *Journal of Cleaner Production*, Vol. 266. Available at <https://doi.org/10.1016/j.jclepro.2020.121519>. Accessed 15.08.2020.
- Design Council. 2020. What is the framework for innovation? Design Council's evolved Double Diamond. Available at <https://www.designcouncil.org.uk/news-opinion/what-frameworkinnovation-design-councils-evolved-double-diamond>. Accessed 8.3.2020.
- Dvir, N. & Gafni, R. 2018. When less is more: Empirical study of the relation between consumer behavior and information provision on commercial landing pages. *Informing Science: the International Journal of an Emerging Transdiscipline*, Vol. 21, pp. 19-39. Available at <https://doi.org/10.28945/4015> Accessed 12.11.2020.
- Edglossary. 2013. Learning environment. *The glossary of education reform*, 29.8.2013. Available at <https://www.edglossary.org/learning-environment/>. Accessed 1.9.2020.
- Ellen MacArthur Foundation. 2013. *Towards the circular economy: Economic and business rationale for an accelerated transition*. Available at

<https://www.ellenmacarthurfoundation.org/assets/downloads/publications/Elle-MacArthur-Foundation-Towards-the-Circular-Economy-vol.1.pdf>. Accessed 15.04.2020.

Ellen MacArthur Foundation. 2015. Towards a circular economy: business rationale for an accelerated transition. Available at <https://www.ellenmacarthurfoundation.org/publications/towards-a-circular-economy-business-rationale-for-an-accelerated-transition>. Accessed 18.08.2020.

Ellen MacArthur Foundation. 2016a. The Ellen MacArthur Foundation's Circular Economy 100 programme launches its USA network. Available at <https://www.ellenmacarthurfoundation.org/news/the-ellen-macarthur-foundations-circular-economy-100-programme-launches-its-usa-network>. Accessed 18.08.2020.

Ellen MacArthur Foundation. 2016b. The new plastics economy – rethinking the future of plastics'. Available at <https://www.ellenmacarthurfoundation.org/assets/downloads/The-New-Plastics-Economy-Rethinking-the-Future-of-Plastics.pdf>. Accessed 18.08.2020.

Ellen MacArthur Foundation. 2018. Renewable materials for a low-carbon and circular future. Available at https://www.ellenmacarthurfoundation.org/assets/galleries/ce100/CE100-Renewables_Co.Project_Report.pdf. Accessed 16.08.2020.

Erlingsson, C. & Brysiewicz, P. 2017. A hands-on guide to doing content analysis. African Journal of Emergency Medicine, Vol. 7, pp. 93-99. Available at <https://doi.org/10.1016/j.afjem.2017.08.001>. Accessed 11.9.2020.

European Commission. 2020. Commission staff working document. Leading the way to a global circular economy: state of play and outlook. Available at https://ec.europa.eu/environment/circular-economy/pdf/leading_way_global_circular_economy.pdf. Accessed 09.08.2020.

European Union. 2020. EU Circular Economy Action Plan. Available at <https://ec.europa.eu/environment/circular-economy/>. Accessed 03.07.2020.

Freytag, P. & Hollensen, S. 2001. The process of benchmarking, benchlearning and benchaction. The TQM Magazine, Vol 13(1), 25-33. Available at [10.1108/09544780110360624](https://doi.org/10.1108/09544780110360624). Accessed 26.2.2020.

Futurimeline. 2020. Ocean plastic pollution forecast to triple by 2040. Futurimeline.net 26.7.2020. Available at <https://www.futurimeline.net/blog/2020/07/26-ocean-plastic-pollution-future-2040.htm>. Accessed 07.08.2020.

Global Recycling. 2019. The Future for e-waste could be bright. Available at <https://global-recycling.info/archives/2952>. Accessed 12.09.2020.

Heikkilä, J., Nurmi, P. & Malve-Alroth, S. 2018. University-company collaboration: A platform for open data innovations in the circular economy. Ammatikasvatuksen Aikakausisarja, Vol. 20(3), pp. 54-58. Available at <https://journal.fi/akakk/article/view/84636> Accessed 14.08.2020.

Hope, J.; Bunce, P. & Röösl, F. 2011. The leader's dilemma: how to build an empowered and adaptive organization without losing control. John Wiley & Sons, Ltd, San-Francisco.

IEA. 2018. Renewables 2018. Analysis and forecasts to 2030. International Energy Agency, 10/2018. Available at <https://www.iea.org/reports/renewables-2018>. Accessed 08.08.2020.

Inayatullah, S. 2013. Future Studies: Theory and Methods. There's a Future: Visions for a better world (Madrid, BBVA, 2013), pp. 33-66. Available at <https://www.bbvaopenmind.com/wp-content/uploads/2013/04/BBVA-OpenMind-Futures-Studies-Theories-and-Methods-Sohail-Inayatullah.pdf.pdf>. Accessed 11.08.2020.

- Interaction Design Foundation. 2020. The basics of user experience design. Available at <https://www.interaction-design.org/ebook>. Accessed 20.8.2020.
- Kurcikova, N. & Littleton, K. Digital learning hubs: theoretical and practical ideas for innovating massive open online courses. *Learning, Media and Technology*, Vol. 42(3), pp. 324-330. Available at <https://doi.org/10.1080/17439884.2015.1054835>. Accessed 15.8.2020.
- Ladu, L. & Quitzow, R. 2017. Bio-Based Economy: Policy Framework and Foresight Thinking. In Morone, P., Papendiek, F., Tartiu, V. (eds.) *Food waste reduction and valorisation*. Springer, Cham. Retrieved from https://doi.org/10.1007/978-3-319-50088-1_9. Accessed 15.08.2020.
- Lazarevic, D. & Valve, H. 2017. Narrating expectations for the circular economy: towards a common and contested European transition. *Energy Research and Social Science*, Vol. 31, pp. 60-69. Available at <https://doi.org/10.1016/j.erss.2017.05.006>. Accessed 19.07.2020.
- Lewandowski, M. 2016. Designing the Business Models for Circular Economy – Towards Conceptual Framework. *Sustainability*, Vol. 8(1), pp. 43. Available at <https://doi.org/10.3390/su8010043>. Accessed 19.07.2020.
- Maciulienė, M. & Skarzauskienė, A. 2016. Evaluation of co-creation perspective in networked collaboration platforms. *Journal of Business Research*, Vol. 69(11), pp. 4826–4830. Available at <https://doi.org/10.1016/j.jbusres.2016.04.038>. Accessed 15.8.2020.
- McLean, L. 2019. A radical economic shift is coming but Canberra isn't talking about it. *The Sunday Morning Herald*, 25.6.2019. Retrieved from <https://www.smh.com.au/environment/sustainability/a-radical-economic-shift-is-coming-but-canberra-isn-t-talking-about-it-20190620-p51zui.html>. Accessed 10.08.2020.
- Mieras, E. 2016. 5 Roads to a circular economy – Part IV: sharing. *Pre-sustainability.com* 16.6.2016. Retrieved from <https://pre-sustainability.com/articles/5-roads-to-a-circular-economy-part-iv-sharing/>. Accessed 12.08.2020.
- Ministry of the environment. 2018. Waste. Retrieved from https://www.ym.fi/en-US/The_environment/Waste. Accessed 18.08.2020.
- Moric, I., Jovanović, J., Doković, R., Peković, S. & Perović, D. 2020. The Effect of Phases of the Adoption of the Circular Economy on Firm Performance. Evidence from 28 EU Countries. *Sustainability*, Vol. 12(6), pp. 2257. Available at <https://doi.org/10.3390/su12062557>. Accessed 12.08.2020.
- OECD. 2018. Global Material Resources Outlook to 2060. Economic drivers and environmental consequences. Available at <https://www.oecd.org/environment/waste/highlights-global-material-resources-outlook-to-2060.pdf>. Accessed 18.07.2020.
- Pewtrusts. 2020. Breaking the Plastic Wave. *Pewtrusts.org*. Available at https://www.pewtrusts.org/-/media/assets/2020/07/breakingtheplasticwave_report.pdf. Accessed 10.08.2020.
- Philips. 2017. Welcome to light as a service. Retrieved from https://images.philips.com/is/content/PhilipsConsumer/PDFDownloads/Global/PDFs/ODL120180105-UPD_en_AA-LaaS_Brochure_Office1.pdf. Accessed 11.10.2020.
- Pijl, P. van der, Lokitz, J. & Solomon, L. 2016. *Design a Better Business: new tools, skills, and mindset for strategy and innovation*. Hoboken, New Jersey: John Wiley & Sons Inc.
- Pimlott-Wilson, H. 2012. Visualising children's participation in research. *Lego Duplo, rainbows and clouds and moodboards*. *International Journal of Social Research Methodology*, Vol. 15(2), pp. 135-148. Available at <https://doi.org/10.1080/13645579.2012.649410>. Accessed 29.8.2020.

Piotrowski, M. 2010. Learning management system technologies and software solutions for online teaching: tools and applications. Available at <https://www.igi-global.com/gateway/chapter/43445>. Accessed 26.9.2020.

Preston, F., Lehne, J. & Wellesley, L. 2019. An Inclusive Circular Economy: Priorities for Developing Countries. Available at <https://www.chathamhouse.org/sites/default/files/publications/research/2019-05-22-Circular%20Economy.pdf>. Accessed 07.04.2020.

Qu, D. & Shevchenko, T. 2019. Universities as a driving force for circular economy implementation in China. Bulletin of Sumy National Agrarian University, Vol. 1(79), pp. 14-20. Available at <https://doi.org/10.32845/bsnau.2019.1.3>. Accessed 18.08.2020.

Rieuf, V.; Bouchard, C.; Meyrueis, V. & Omhover, J-F. 2017. Emotional activity in early immersive design: Sketches and moodboards in virtual reality. Design Studies, Vol. 48, pp. 43-75. Available at <https://doi.org/10.1016/j.destud.2016.11.001>. Accessed 29.8.2020.

Silpa, K.; Yao, L.; Bhada-Tata, P. & Van Woerden, F. 2018. What a waste 2.0. A global snapshot of solid waste management to 2050. World Bank Group. Available at <http://documents1.worldbank.org/curated/en/697271544470229584/pdf/132827-PUB-9781464813290.pdf>. Accessed 13.07.2020.

Sitra. 2013. Towards a sustainable well-being society. Available at <https://www.sitra.fi/en/publications/towards-sustainable-well-being-society/>. Accessed 19.04.2020.

Sitra. 2016. Finnish Road Map to a Circular Economy. Available at <https://www.sitra.fi/en/projects/leading-the-cycle-finnish-road-map-to-a-circular-economy-2016-2025/#latest>. Accessed 04.04.2020.

Sitra. 2017. Road map helps Finland's transition to a circular economy. Available at <https://www.sitra.fi/en/articles/road-map-helps-finlands-transition-circular-economy/>. Accessed 17.04.2020.

Sitra. 2018. The Circular Economy needs more experts in Mathematics and Natural Sciences. Blog Post, 28.3.2018. Available at <https://www.sitra.fi/en/blogs/circular-economy-needs-experts-mathematics-natural-sciences/>. Accessed 15.08.2020.

Sitra. 2019a. Leadership training for sustainable economic policy. Available at <https://www.sitra.fi/en/topics/leadership-training-sustainable-economic-policy/#what-is-it-about>. Accessed 08.07.2020.

Sitra. 2019b. The most interesting company in circular economy in Finland. Available at <https://www.sitra.fi/en/projects/interesting-companies-circular-economy-finland>. Accessed 15.08.2020.

Sitra. 2019c. The most interesting company in circular economy in Finland. Business examples. Available at <https://www.sitra.fi/en/projects/interesting-companies-circular-economy-finland/#business-examples>. Accessed 15.8.2020.

Sitra. 2019d. Circular economy teaching for all levels of education. Available at <https://www.sitra.fi/en/projects/circular-economy-teaching-levels-education/>. Accessed 08.07.2020.

Sitra. 2020. Training. Sitra brings together change-makers to collaborate on building the successful Finland of tomorrow. Available at <https://www.sitra.fi/en/themes/training/#what-is-this-about>. Accessed 15.08.2020.

Sitra, WCEF. 2020. Rebuilding the economy with circular solutions. Available at <https://www.sitra.fi/en/projects/wcefonline/>. Accessed 15.08.2020.

Smart & Clean. 2020. How to make a systemic change into a 1,5°C society together. Smart & Clean Foundation. Available at <https://smartclean.fi/en/systemic-change/>. Accessed 15.08.2020.

Smart Energy Transition. 2017. Finnish Energy System can be made 100% Fossil Free. Available at <http://smartenergytransition.fi/en/finnish-energy-system-can-be-made-100-fossil-fuel-free/>. Accessed 18.08.2020.

Sormunen, K. & Tiilikainen, K. 2017. The circular economy enters the world stage, with Finland leading the way. The Guardian 6.6.2017. Available at <https://www.theguardian.com/global-development-professionals-network/2017/jun/06/the-circular-economy-enters-the-world-stage-with-finland-leading-the-way>. Accessed 12.04.2020.

Spaniol, M.J. & Rowland, N.J. 2019. Defining scenario. Futures Foresight Sci., Vol. 1(1). Available at <https://onlinelibrary.wiley.com/doi/epdf/10.1002/ffo2.3>. Accessed 12.04.2020.

Stahel, W.R. 2016. The circular economy. Nature, international weekly journal of science 23.3.2016. Available at <https://www.nature.com/news/the-circular-economy-1.19594>. Accessed 10.04.2020.

Stahel, W.R. & Clift, R. 2016. Stocks and Flows in the Performance Economy. In: Clift, R., Druckman, A. (eds) Taking Stock of Industrial Ecology. Springer, Cham. Available at https://doi.org/10.1007/978-3-319-20571-7_7. Accessed 12.04.2020.

Statistics Finland. 2020. Educational institution. Available at http://www.stat.fi/meta/kas/oppilait_en.html. Accessed 1.9.2020.

Stickdorn, M.; Hormess, M.; Lawrence, A. & Schneider, J. 2018. This is Service Design Doing: applying service design thinking in the real world: a practitioner's handbook. Sebastopol, CA: O'Reilly Media Inc.

SYKE (Suomen ympäristökeskus). 2018. Towards the Circular Economy. Available at <https://www.syke.fi/circulareconomy>. Accessed 05.07.2020.

Techterms. 2009. Hardware terms: Led definition. Available at <https://techterms.com/definition/led>. Accessed 11.10.2020.

Telaketju. 2020. About telaketju. Available at <https://telaketju.turkuamk.fi/en/about-telaketju/>. Accessed 13.08.2020.

Thomas, H. 2010. Learning spaces, learning environments and the displacement' of learning. British Journal of Educational Technology, Vol. 41(3), pp. 502–511. Available at <https://doi.org/10.1111/j.1467-8535.2009.00974.x>. Accessed 15.8.2020.

Topinpuisto. 2020a. In <http://www.topinpuisto.fi/en/>. Accessed 5.4.2020.

Topinpuisto. 2020b. Contact. In <https://www.topinpuisto.fi/en/contact/>. Accessed 5.4.2020.

Topinpuisto. 2020c. Learning environment. In <https://www.topinpuisto.fi/en/a-learning-environment/>. Accessed 5.4.2020.

TUAS. 2020. Kiertotalouden liiketoimintamallit. Available at <https://www.turkuamk.fi/fi/tutkimus-kehitys-ja-innovaatiot/tutkimusryhmat/kiertotalouden-liiketoimintamallit/>. Accessed 17.8.2020.

Tuominen, K. 2016. Introducing Benchmarking, Benchmarking Ltd. Available at <https://ebookcentral.proquest.com/lib/turkuamk-ebooks/reader.action?docID=4883137>. Accessed 4.4.2020.

Turku.fi. 2019. Increasing the circularity ambitions of regional waste management with Lounais-Suomen Jätehuolto Oy. Available at

https://www.turku.fi/sites/default/files/atoms/files//circular_turku_-_case_study_2.pdf. Accessed 13.08.2020.

Vasileios Rizos, V. R.; Katja Tuokko, K. T. & Arno Behrens, A. B. 2017. The Circular Economy: A review of definitions processes and impacts. CEPS Research Report No 2017/8, April 2017. Available at http://aei.pitt.edu/85892/1/RR2017-08_CircularEconomy_0.pdf. Accessed 15.08.2020.

Viens, A. 2019. The Circular Economy: Redesigning our planet's future. Visual Capitalist. 8.10.2019. Available at <https://www.visualcapitalist.com/the-circular-economy-redesigning-our-planets-future/>. Accessed 10.08.2020.

Weigend, R.; Pomponi, F.; Webster, K & D'Amico, B. 2020. The future of circular economy and the circular economy of the future. Built Environment Project and Asset Management, Vol. 10(4), pp. 529-546. Available at <https://www.emerald.com/insight/content/doi/10.1108/BEPAM-07-2019-0063/full/html>. Accessed 15.07.2020.

Weprin, M. 2016. Design Thinking Methods: Affinity Diagrams. Available at <https://uxdict.io/design-thinking-methods-affinity-diagrams-357bd8671ad4>. Accessed 15.4.2020.

Organizations reviewed in benchmarking

Category	Organization	Site
Current learning environment	Topinpuisto	https://www.topinpuisto.fi/palvelut/oppimisymparisto/
Circular Economy Hub	Circular Economy 2.0. (TUAS)	https://kiertotalous2.turkuamk.fi/en/front-page-en/
Circular Economy Hub	Metabolon Leffe	https://www.bavweb.de/-metabolon/Forschung/Lehre/Forschungs-Camps/
Circular Economy Hub	Vera Park	https://verapark.se/hubben/
Circular Economy Hub	Amager Ressource Center (ARC)	https://www.a-r-c.dk/
Circular Economy Hub	Harvard University	https://green.harvard.edu/
Student Matchmaking	Y-Kampus Tampere / Y-makers	https://y-makers.fi/fi/
Student Matchmaking	Aarresaari	https://www.aarresaari.net/yhteystiedot
University cooperation	Korkeakoulukumppani / University partner	https://korkeakoulukumppani.fi/en/home/
University cooperation	Turku University of Applied Sciences	https://www.turkuamk.fi/fi/tyoelamapalvelut/koulutukset-ja-palvelut/
University cooperation	University of Turku	https://www.utu.fi/fi
University cooperation	Åbo Akademi	https://www.abo.fi/fi/tutki-kanssamme/
University cooperation	Humak University of Applied Sciences	https://www.humak.fi/innovaatiopalvelut/
University cooperation	Novia University of Applied Sciences	https://www.novia.fi/forskning/fou/
University cooperation	Diaconia University of Applied Sciences	https://www.diak.fi/tyoelamapalvelut/
University cooperation	LUT University	https://www.lut.fi/yhteisty-ja-palvelut;jsessionid=9ACDF65B5D8AE9F0DD250B666ED82326.wwwlut1
University cooperation	The Summer University of Turku	https://www.turunkesayliopisto.fi/yrityksille
University cooperation	Aalto University	https://www.aalto.fi/en/corporate-collaboration
University cooperation	Tampere University	https://www.tuni.fi/fi/palvelut-ja-yhteisty

Interview questions

BACKGROUND INFORMATION

- Short presentation who you are, where you come from and what you do

QUESTIONS ABOUT CIRCULAR ECONOMY 2.0 (for teachers only)

- How would you describe circular economy 2.0.?
- What would you consider as challenges with Topinpuisto as regards to circular economy 2.0.?

COOPERATION WITH TOPINPUISTO & STUDENT PROJECTS

- What is your company's/schools connection to Topinpuisto?
- What has been your experience with Topinpuisto/ other partners in Topinpuisto network?
 - In how many projects have you had cooperation with Topinpuisto?
 - What type of student projects have you had and how many?
- How have you established the cooperation in these cases?
- How has it been communicating with Topinpuisto as a partner?
 - How have you usually established the cooperation in these cases? (phone, e-mail, webpage)
 - Does Topinpuisto contact you and they are asking for projects or you recognise that you have projects where you could use students?
- How many projects can you possibly have in a year that students can work on?
- How much resource can you give to students to work on in your company?

THE USER'S MAIN OBJECTIVES AND MOTIVATIONS

- What is your company's/schools main reasons to cooperate with Topinpuisto in different projects?
- What are your expectations from the cooperation with Topinpuisto?
- What are your expectations from the companies/student work and cooperation with students?
- What do you see as the most beneficial in this kind of cooperation?

THE USERS PAIN POINTS

- What are the main challenges you have discovered in the cooperation?
- In what areas could the companies/schools serve you better?
- In what areas could Topinpuisto serve you better?

LEARNING PLATFORM SITE / LEARNING ENVIRONMENT PAGE

- How would you like to assign projects between your organization and the schools preferably?
- What kind of information would you like to find from the website?
- What would be the most convenient way to have information available about different projects or student work?

Brainstorming the learning platform

The researchers executed the workshop tasks in order to empathize with the service users and to ideate possible solutions to the learning platform. Brainstorming was done 25.5.2020, before the stakeholder workshop, and followed the same process and ways of working what was applied with the stakeholders. The purpose of the first topic was to focus on the information that needs to be agreed when setting project assignments and the results are presented in the figures below “Brainstorming results”.

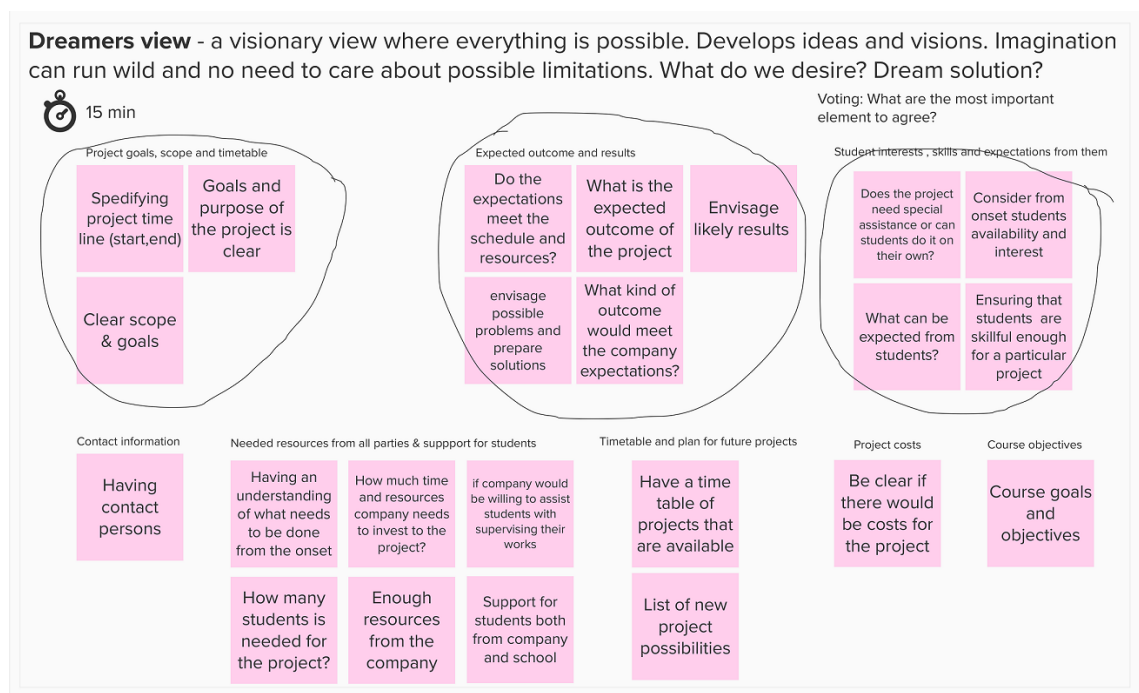


Figure: Brainstorming results, dreamers view.

The dreamers view produced seven elements or themes that were found important. These were: project goals, scope and schedule; expected outcome and results; project costs; contact information; needed resources from all parties; student interests, skills and expectations towards them; and the amount of support that students need. From these topics, the researchers voted most important ones and selected project goals, scope and timetable; expected outcome and results as well as student skills and expectations to the realist view to be elaborated further.

Realist view - divides the goal in smaller steps. Reflects and asks himself the following questions: What needs to be done? What is needed for the implementation (material, people, resources, knowledge, techniques, etc.)? What do you feel about this idea? Which basics are already available?

🕒 15 min

Project goals, scope and timetable			Expected outcome and results		Student interests, skills and expectations from them	
Goals and purpose of the project is clear	Clear scope & goals	Specifying project timeline	Envisage likely results	Envisage possible problems and prepare solutions	Consider from onset students availability and interest	What can be expected from students?
Agreeing ways of working for the project	Expert views are important	Goals written down	Agree ways of communicating in the project	Supervision from both sides may be needed	Course goals clearly stated	Knowing which year students are taking the project
Write down topics or subjects of interest	Set up a project meeting with all parties	Agreeing timetable & responsibilities	Agree how the project results are delivered	Give as much resources as needed in terms of materials or documents	Time management	Ensuring commitment
Agreeing company contact names	Agree how much guidance is expected from the company	Bringing costs visible	Prepare list of things to achieve and discuss with stakeholders	Thinking if students need access to some resources?	Aligning project schedule with course schedule	Aligning course goals with company goals

Figure: Brainstorming results, realist view.

Regarding project scope and schedule, the realist view highlighted the importance of agreeing the formal elements of the project and preferably putting these on a paper. These included ways of working in the project, goals, timetable, responsibilities, and resources needed from the company, contact names and project meetings. It was seen that expected outcome and results of the project should include agreeing on ways of communicating in the project, supervision of work from both sides, ensuring access to resources for students, agreeing on how the project results are delivered as well as preparing a list of things to be achieved. Problems that the project may face should be envisaged and already prepare solutions for those. Regarding expectations from students, the participants should ensure that course goals and schedules are aligned with company goals and schedules to ensure student commitment. Schools should also ensure that students have needed skills to execute projects.

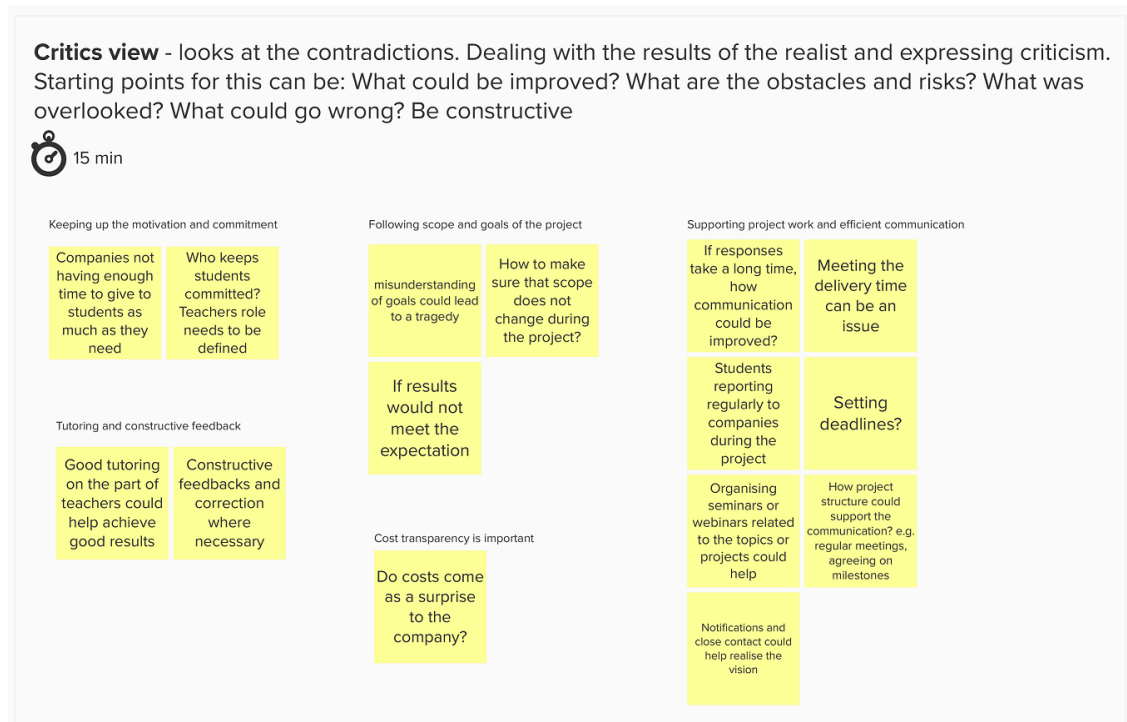


Figure: Brainstorming results, critics view.

The critics view brought up that possible risks or obstacles might lie in keeping up motivation and commitment of students, following scope and goals of the project, supporting project work and efficient communication, ensuring cost transparency as well as tutoring students and giving them constructive feedback. These possible pitfalls once again highlight importance of project goals and responsibilities and commitment to the project. In addition, projects should be made with right set of people and all parties should find motivation to ensure that project is followed and concluded. In addition, project possibilities and ideas could be shared already in an early phase so that they could be processed together.

The second workshop topic focused on planned project categorization, which would work as a framework for already done and upcoming projects. The purpose was to discuss the benefits and drawbacks of these categories and the results are presented in the figure below “Brainstorming results, task 2”.

Aspect 1. What are the benefits and possibilities of this categorization? How does it serve your organization?

🕒 15 min

Provide structure and easy to plan topics in advance

Early contacts and registering of project ideas	Curriculum is easier to construct	Teachers could think how they could adapt the categories in their courses
Students can easily find these topics	Easy to prepare topics beforehand	Easy to relate new projects with existing ones

Can be applied to several companies, departments and courses

Categories apply to several types of organizations / departments	Participating several departments from the university	It can be used for several types of courses
--	---	---

Overview from past research and references

Contacts are easier to get since there is previous research	Collaboration is easier, looking for companies in the same research topics
---	--

Gives ideas to further development

Categories give ideas to companies that what could be developed	Topics are looking to the future and developing the organization	Topics give development ideas that can be adapted to each organization
---	--	--

Facilitate further development

Build on the technology used earlier	Applying theory from several areas possible
Makes further development easier and faster	Structures ideas of developing or optimizing operations

Versatile and indicate results

Categories indicate about the expectations of the results	Categories are versatile
---	--------------------------

Aspect 2. What are the drawbacks of these categories? What is missing? What alternatives there are?

🕒 15 min

Categories restrict creating of projects and participants

Companies not interested in the available projects	Categories do not match with university study categories	Categories rule out students that do not study circular economy
--	--	---

Supports similar types of projects

Saturation may start to occur	Categories make you "fit" your project under one of these
-------------------------------	---

Restrict development work or project creation
A category is picked because you have to

Categories restrict the development work?	You do not create projects if you don't feel it fits to a category	It may streamline thinking outside the box
---	--	--

Do not serve the needs

Unexpected situation may call for different kind of research not considered in the categorisation	Is there room for cross-category projects?
---	--

Encouraging laziness?

Deciding category can be a headache if it needs to be defined too early

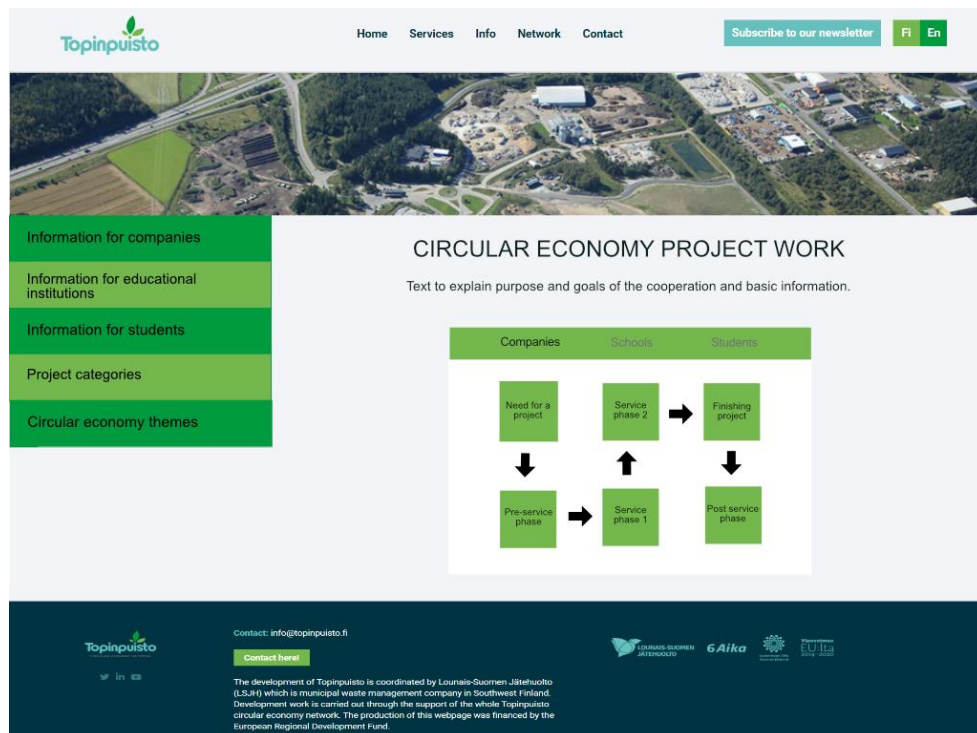
Figure: Brainstorming results, task 2.

As benefits and possibilities for the categorization it was seen that categorization provides structure and it is easy for all parties to plan project topics in advance. Categories can also be applied to several companies, departments and courses; they are versatile and already give some indications about the results. Furthermore, it was seen that categories give good overview from the past research and present reference cases but they give ideas and facilitate further development work. As drawbacks of the categorization it was seen that they might restrict creation of projects or project participants, they support similar types of projects and might not serve needs of the companies or do not match how research is categorized in universities and schools. They also might restrict development work and a category is picked only because you have to. In these cases, it seems that it would be important to ensure that the categorization gives room for cross-category projects, supports innovative thinking and does not rule out projects not directly linked to circular economy because these could still provide new aspects to the field of circular economy. Thus, categories should not be something that guideline or restrict the project creation too much.

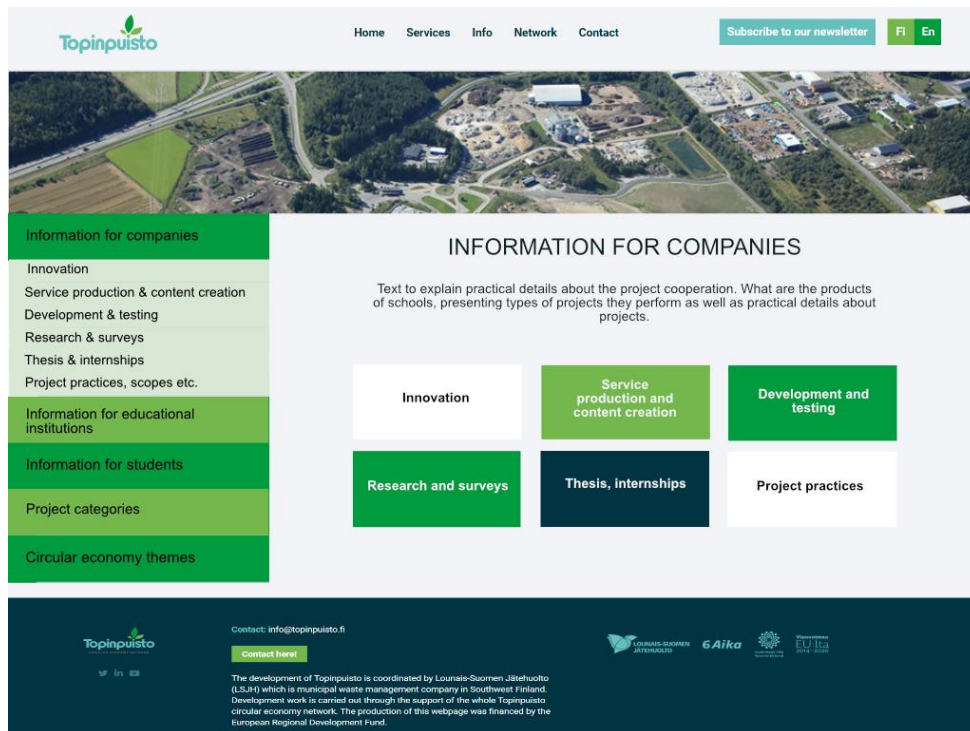
Learning platform prototype visualization



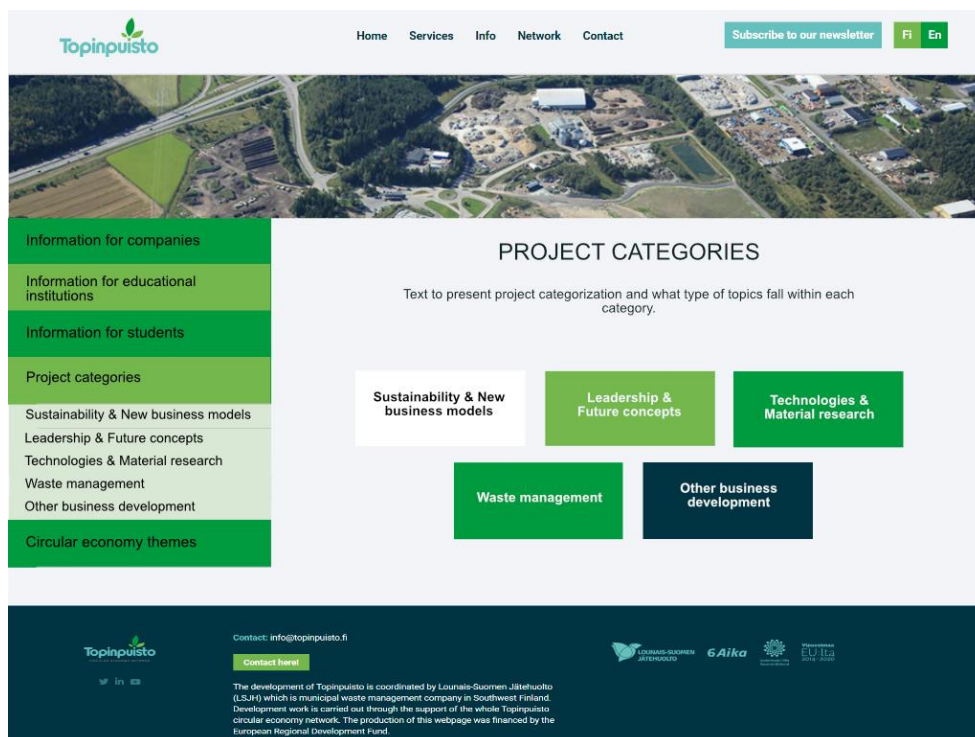
Landing page



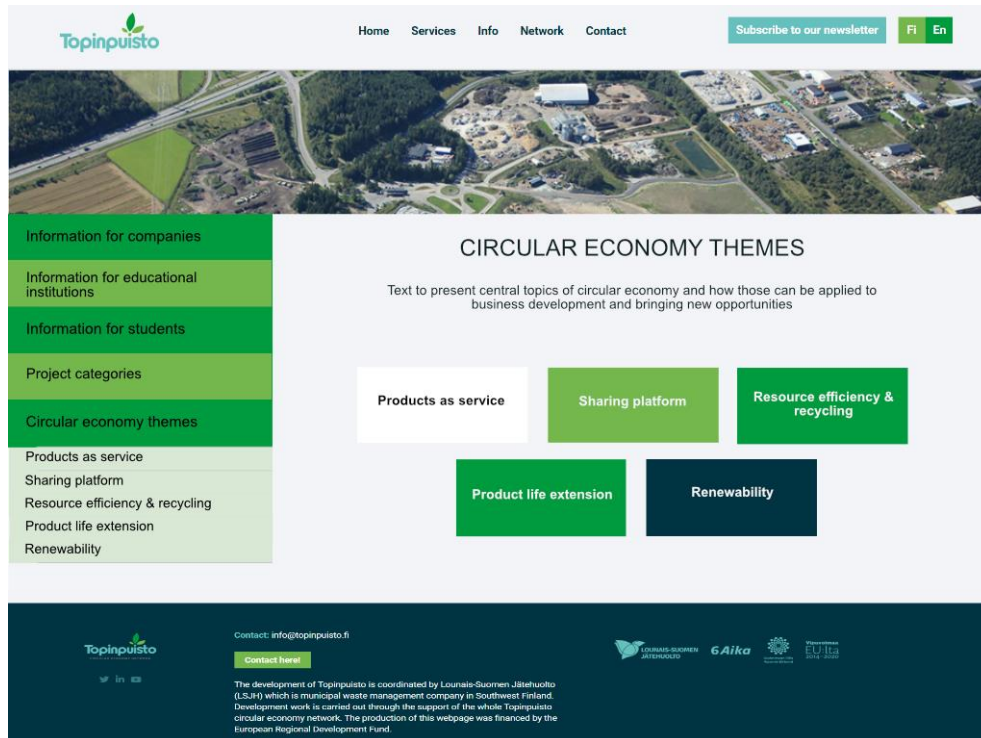
Circular economy project work



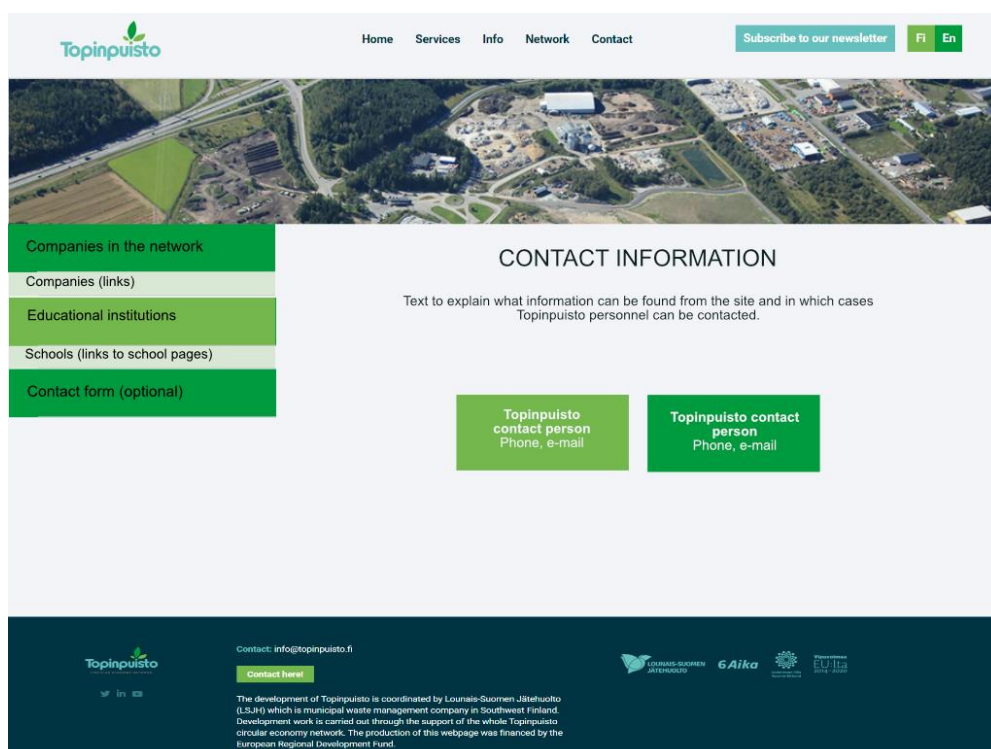
Information for companies



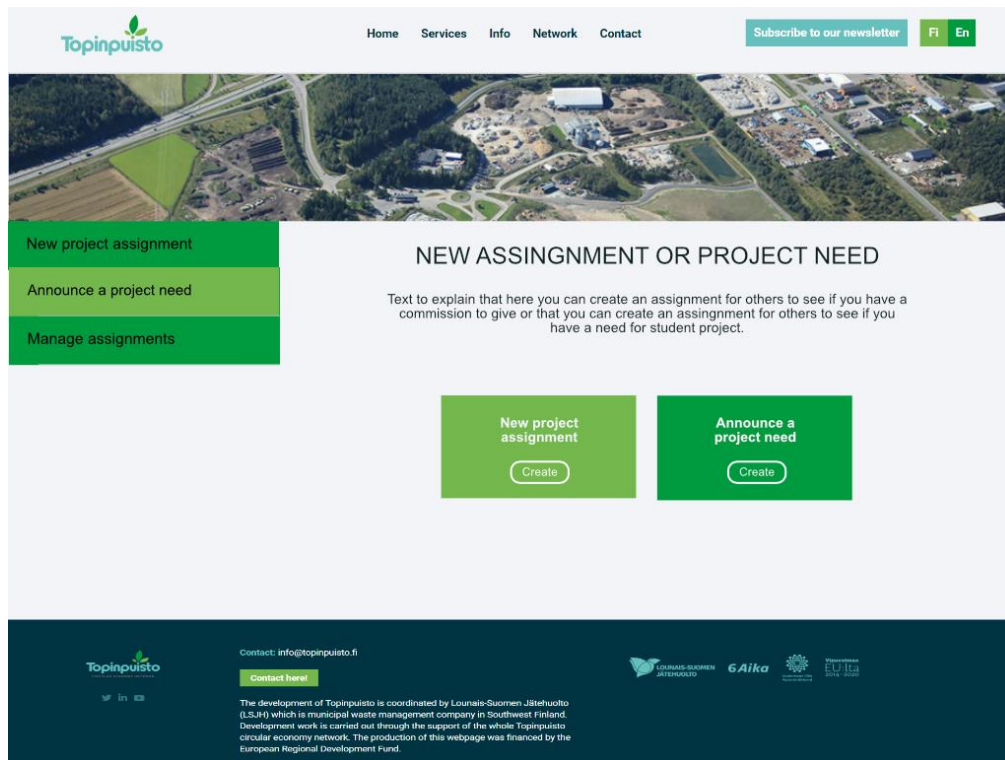
Project categories



Circular economy themes

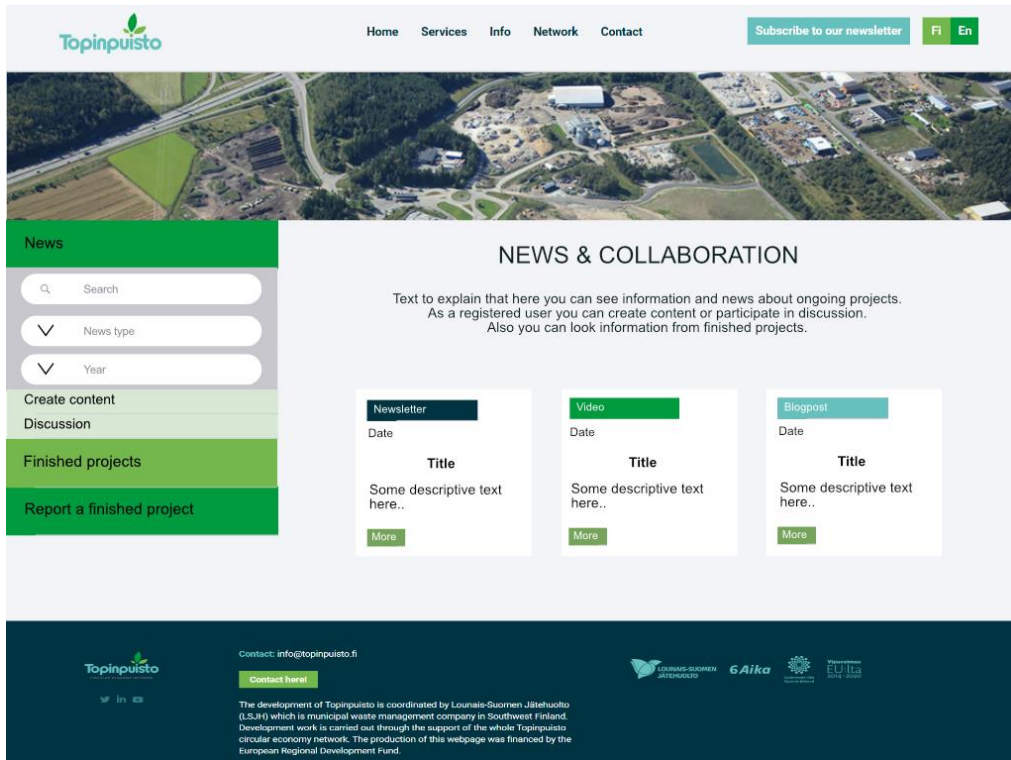


Contact information

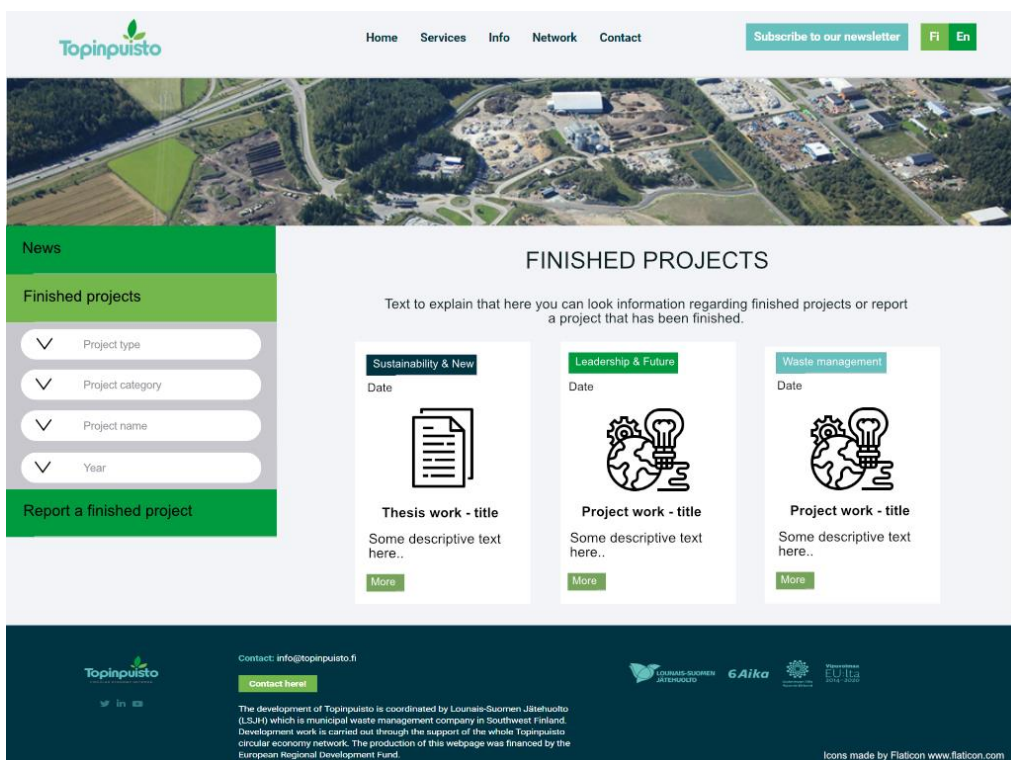


New assignment or project need

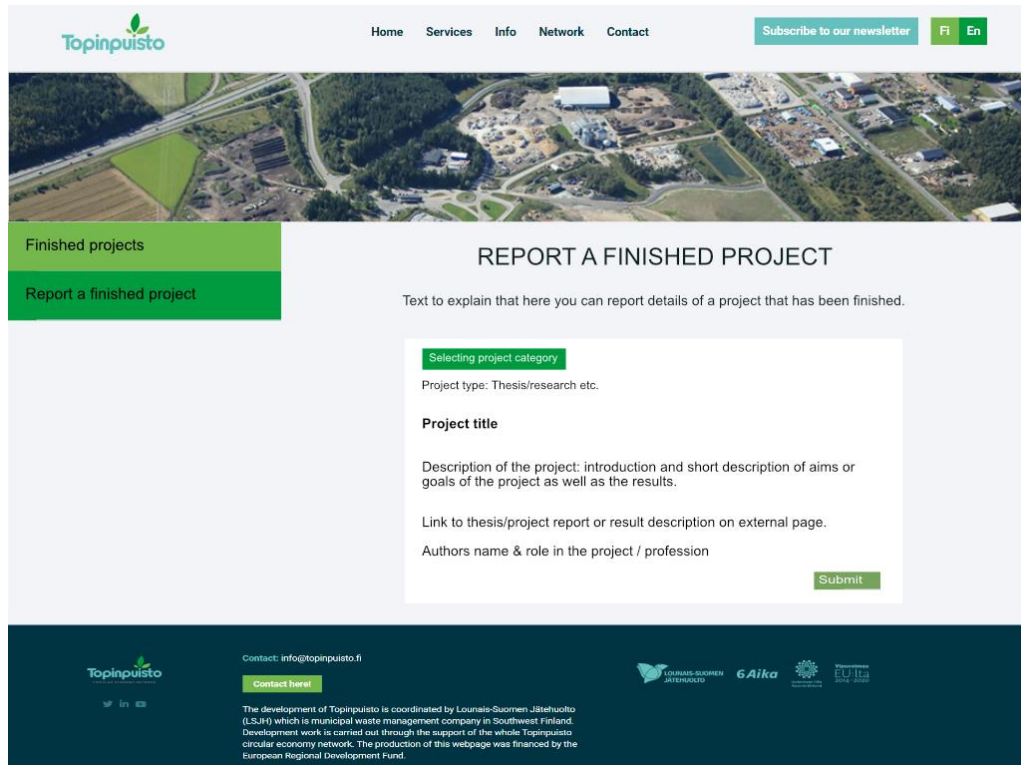
Project forms



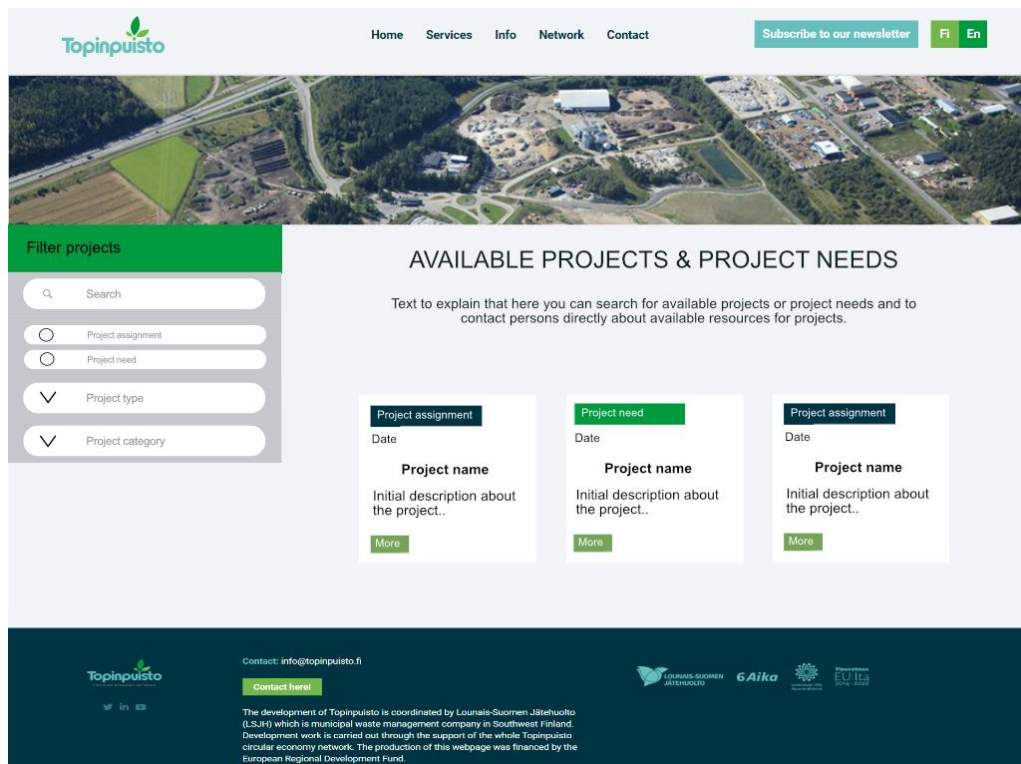
News and collaboration



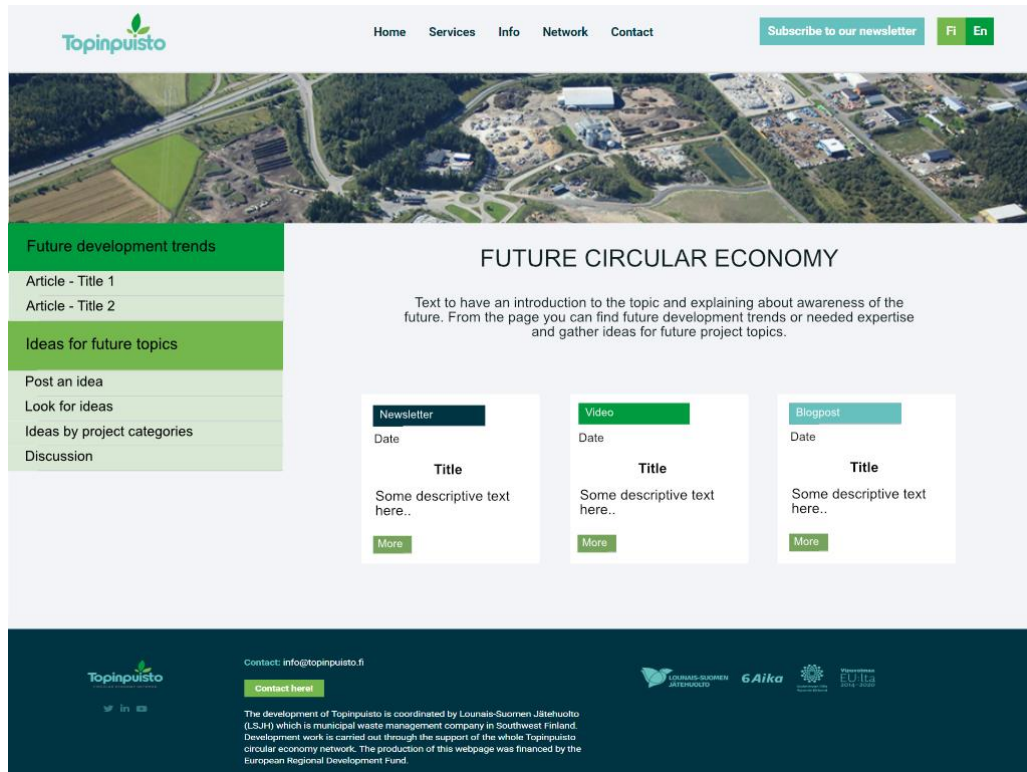
Finished projects



Report a finished project



Available projects and project needs

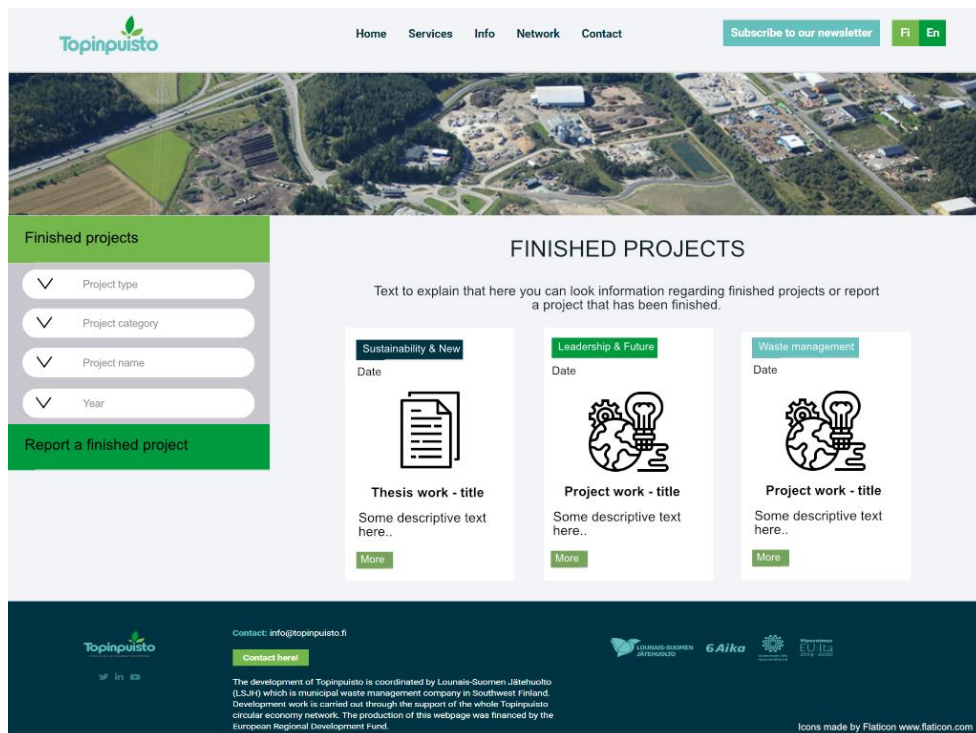


Future circular economy

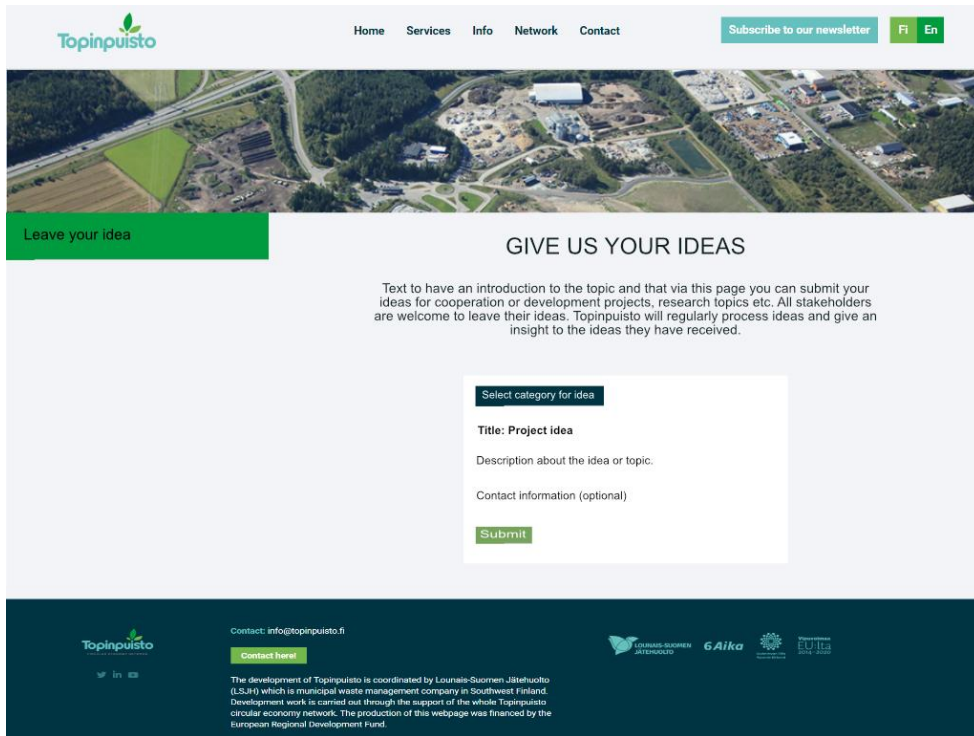
Modified learning platform prototype visualization



Modified landing page



Modified news and collaboration block



Modified future circular economy block