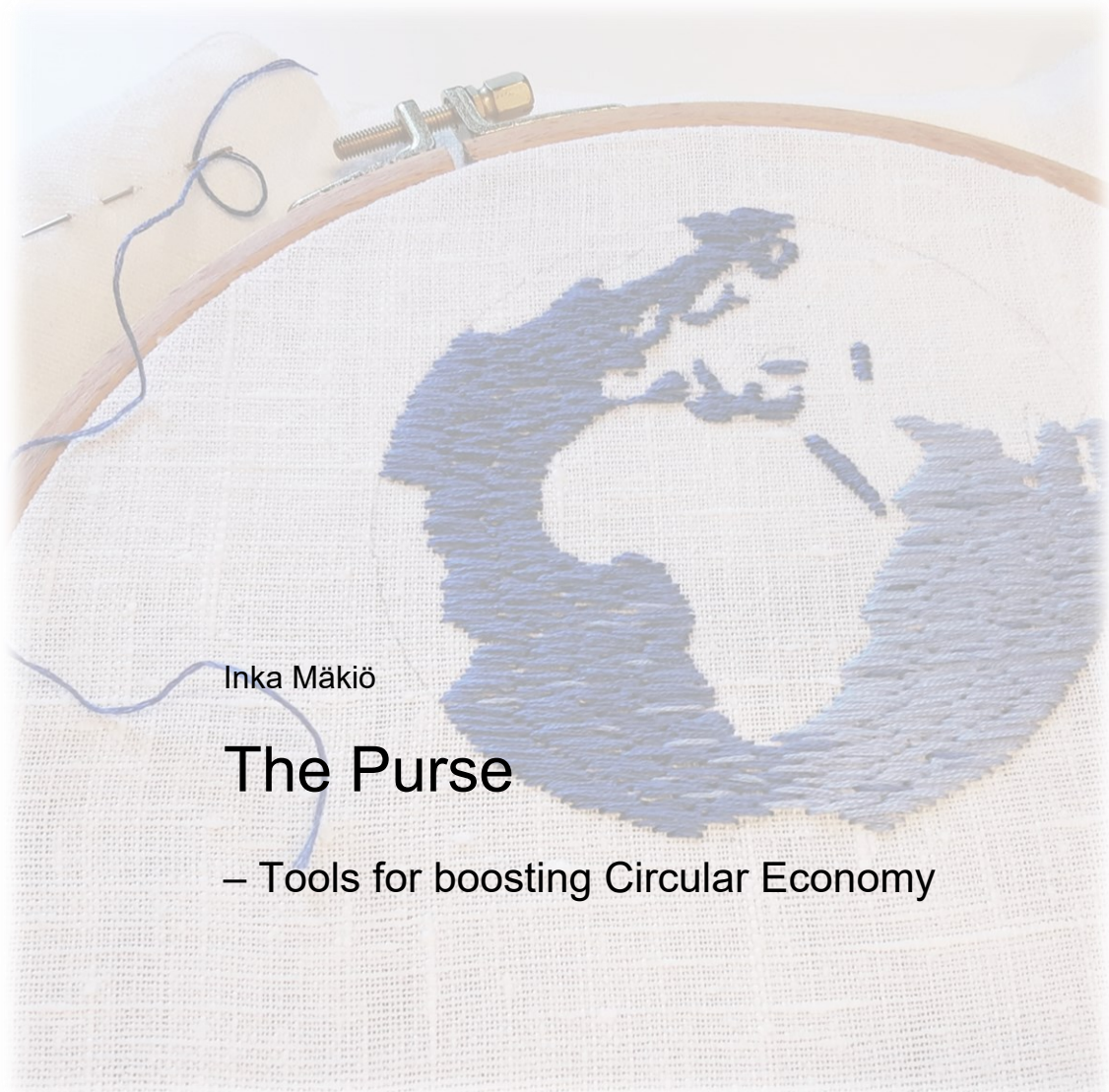Master's thesis

Service Design and Leadership

Inka Mäkiö

The Purse

– Tools for boosting Circular Economy

TURKU AMK

TURKU UNIVERSITY OF
APPLIED SCIENCES

Inka Mäkiö

The Purse

- Tools for boosting Circular Economy

The Purse is a collection of tools and methods that one research group of Turku University of Applied Sciences is using to help companies and organizations to move towards more sustainable ways to do business. The Circular Business Models research group has a long history and methodology of working together with companies. Throughout different projects, the research group has developed a diverse collection of tools and methods. These tools are now gathered to one toolbox called the Purse. The aim of the Purse is to offer tools for boosting Circular Economy for people facilitating the process. The main idea of circular economy is to decouple business from wasting resources and offer alternatives for linear economy's destructive growth.

The aim of this thesis was to gather and introduce all the tools and methods the Circular Business Models research group of the Turku University of Applied Sciences is using to help organizations to shift towards more sustainable world. This thesis is describing the background of the way of working, it ties the tools and methods to the futures studies, circular economy, design thinking and open access, and concludes with the concept that the gained knowledge should be utilized even more in the future. This thesis introduces several projects, where the development work is done. It also includes the introduction of the tools and methods that were selected into the Purse.

Keywords:

circular economy, service design, tools, methods

Inka Mäkiö

Veska

- työkaluja kiertotalouden edistämiseen

Veska (*the Purse*) on kokoelma työkaluja ja menetelmiä, joita Turun ammattikorkeakoulun Kiertotalouden liiketoimintamallit tutkimusryhmä käyttää auttaakseen yrityksiä ja organisaatioita löytämään kestävämpiä tapoja harjoittaa liiketoimintaa. Tutkimusryhmä on tehnyt pitkään yhteistyötä yritysten kanssa ja kehittänyt työskentelymenetelmiä jatkuvasti. Tutkimusryhmä on kehittänyt monipuolisen kokoelman työkaluja ja menetelmiä eri projekteissa. Nämä työkalut kootaan nyt yhteen kokoelmaan nimeltä Veska. Veskan tavoitteena on tarjota fasilitaattoreille työkaluja ja menetelmiä kiertotalouden edistämiseen. Kiertotalouden pääajatuksena on irtikytkeä liiketoiminta resurssien tuhlaamisesta ja tarjota vaihtoehtoja lineaarisen talouden tuhoisalle kasvulle.

Tämän opinnäytetyön tavoitteena oli koota ja esitellä Turun ammattikorkeakoulun Kiertotalouden liiketoimintamallien tutkimusryhmän kestävyyssiirtymän tukemiseen kehittämiä työkaluja. Opinnäytetyössä kuvataan työskentelytavan taustoja, sidotaan työkalut ja menetelmät tulevaisuudentutkimukseen, kiertotalouteen, muotoiluajatteluun ja avoimen saatavuuden periaatteisiin, ja päädytään siihen konseptimalliin, että työkaluja kannattaisi hyödyntää entistä enemmän tulevaisuudessa. Opinnäytetyössä esitellään useita projekteja, joissa työkalujen kehitystyötä on tehty. Työ esittelee myös Veskaan valitut työkalut ja menetelmät.

Asiasanat:

kiertotalous, palvelumuotoilu, työkalut, menetelmät

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List of abbreviations (or) symbols

ANE	Association of Nordic Engineers
CC	Creative Commons
CE	Circular Economy
GHG protocol	Greenhouse Gas Protocol
LCA	Life Cycle Analysis
OA	Open Access
PaaS	Product as a Service
SDG	Sustainable Development Goals by United Nations
STEM	Science, Technology, Engineering, and Math professionals
Turku UAS / TUAS	Turku University of Applied Sciences
UN	United Nations
UNESCO	The United Nations Educational, Scientific and Cultural Organization

1 Introduction

The world as we know it is going to end. The change involves everybody in the society and around the globe. There are known facts about climate change, biodiversity loss and growing societal inequality. There are known changes that can affect the reduction of environmental footprint and increase ecological and societal sustainability in societies and in companies. And there are known methods for how to facilitate the change.

One of the most important tasks of universities of applied sciences in Finland is to help and support local businesses and society. The obvious way is to produce qualified employees for the companies through education, but there are other ways to help as well. For example, all higher educational institutes in Finland work closely with surrounding society and global collaborations through different nationally or internationally funded projects. The aim of this thesis is to gather, evaluate and develop further the tools and methods the Circular Business Models research group of Turku University of Applied Sciences is using to help organizations to shift towards more sustainable world.

The Circular Business Models research group in Turku University of Applied Sciences (Turku UAS) has been helping companies to adopt the change to more sustainable business through projects and student-company cooperation. The author of this thesis has been working in the research group for more than six years as a service designer and circular economy expert. She has been developing and using many of the tools and methods gathered to the Purse. The research group is a team of experts from different fields, and the fields are presented in the figure 1. The research group consists of different experts from business and education to engineering, sociology, and design. The composition and size of the group has changed from year to year depending on the going projects.
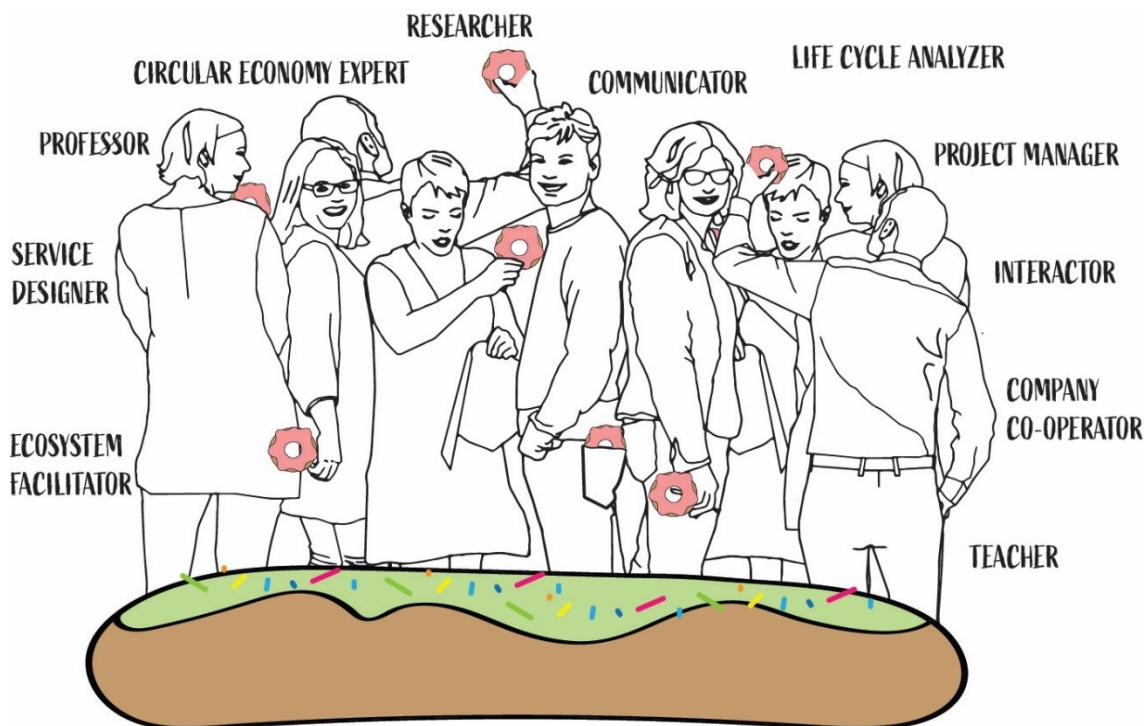
Figure 1. The Circular Business Models research group (Inka Mäkiö, 2023).

This thesis is introducing the tools and methods that the author has tested and developed together with the research group in different projects. These tools have stayed in use after the projects have ended. This thesis will explain where and how the tools were developed, why they were chosen to be introduced, how to use them and examples of where tools have been in use. During this process, the Purse has been developed and published by the research group in order to serve as an open access toolbox / handbag called *The Purse* (*Veska* in Finnish).

The content of the thesis includes an introduction to the topic and research methods. Next, it introduces the most relevant theories from the fields of the sustainable shift and service design, that effect the content of the Purse. Theory is followed by empirical part where the process of gathering the Purse is described. The output is presented in the fifth chapter which is the content of the Purse. That is followed by chapter that describe the Purse in use, and the thesis ends with a summary of the process and suggestions for the future.

1.1 The Purse

The content of the Purse is following a service design framework, which is presented in the figure 2. The phases are understanding, defining, research, ideating, testing, and launching. The documentation is mentioned in the base of the framework to recall the importance of it. These phases build up the skeleton for the tools and methods and are used to guide the reader through the Purse.

The aim of the Purse is to offer tools for boosting circular economy. The main idea in circular economy is to decouple business from wasting resources and to offer alternatives for linear economy's destructive growth. These themes are introduced in the theory chapter 3.1 and 3.2. The Purse is intended for those who facilitate the development processes together with stakeholders.

The content follows a design process, starting with understanding. Tools of the first phase help companies to understand, that there are things they can do to shift to more sustainable operations. Then comes the defining phase, where the tools are helping to figure out the starting points and choosing first problems to be solved. The research phase takes a look on arranging research situations and documenting the research. The ideating phase is often done with students and the tools from this phase are presenting different ways to cooperate with them. The testing phase introduces a template for documenting the demonstrations and an example of guide for testing business models. The launching phase is gathering tools for communicating and documenting.
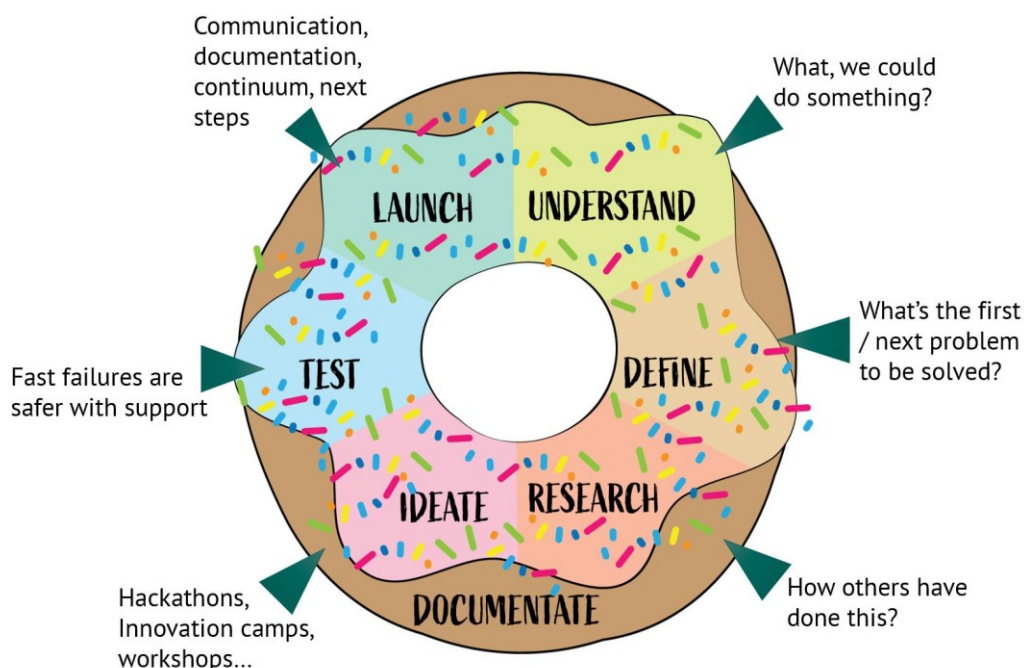
Figure 2. Content of the Purse with usage suggestions (Inka Mäkiö, 2023).

The role model for the Purse is a textile circular economy suitcase, that was developed during the years 2018-2021 in *Telaketju* projects, where the research group was one of the research partners. The suitcase is filled with responsibly made textile products and examples, and it performed in many situations as exhibition for development as presented in Picture 1. The suitcase is concrete showcase for innovations in circular textiles and the research group felt that there is a need for gathering the tools and methods similarly together.

Picture 1. Telaketju-suitcase performing in different situations (Inka Mäkiö, n.d).

Often in the design field, the templates and methods are called tools, and they are gathered to a toolbox. The research group felt unsure about both terms. A tool is anyhow a usable wording for templates that are used for doing something. The value of the word is also behind it, there is a need for an expert to use the tool properly. That is the reason, why the templates and methods are called tools in this thesis, even they are not gathered to a place called toolbox. The Purse is like Mary Poppin's magic bag, containing suitable elements for all occasions.

1.2 Working with companies

The Circular Business Models research group works closely with companies and organizations. The methodological basis was structured in *TRY OUT!* -project, where an *Innovation platform for circular economy experiments* was developed. The learnings from developing innovation platform have been the basis for the project learning environment *Circular Economy 2.0* in Turku UAS.

Learning environments, like the *Circular Economy 2.0*, are one of the operating methods of Turku UAS and they are based on the pedagogical strategies of Turku UAS. Briefly, in the learning environment *Circular Economy 2.0* the learning is happening when students join in different projects and company works of the Circular Business Models research group.

The co-working with companies and students is in the core of the research group's way of working. There are several methods that are developed to enable fruitful co-working. These are introduced in chapter 5 with other tools of the Purse. Working together with companies increase important skills that the students need in the future. These skills include such as mindset for sustainable solutions and technical and analytical competence for circular economy possibilities. These are introduced more closely in the theory chapter 3.2.

TRY OUT!: Kiertotalous- ja cleantechideat kokeiluun was a European Regional Development Fund's Six Cities (6Aika) -funded project lead by Turku University of Applied Sciences and partnered with Demos Helsinki and the universities of Helsinki and Turku. *TRY OUT!* was running during 8/2016-7/2018. The project

built an innovation platform based on a culture of experimentation and co-development. In the core was an experimental environment, which provided the opportunity to experiment with new forms of circular economy business models, intersectoral practices, and forms of cooperation. The purpose was, that the most effective experiments will remain alive and move on to the market. The innovation platform mentioned here is more like a process of experimenting the circular economy possibilities. (TRYOUT!, 2023)

The innovation platform is presented in the picture 2. The phases of the innovation platform are introduced in a form of a circle path. First phase is defining the need, where the company expresses their interest in cooperation. That is followed by a kick-off meeting, where the objectives and goals are defined. Those can be new solutions, products, services, circular business models or testing and developing something for the company. Then an action plan is made, and multidisciplinary student teams are formed. Fifth phase is co-creation, where different co-creation tools are used. Interaction is one essential part of the innovation process in Turku UAS and one phase is dedicated for interaction with associations, business developers, experts and the city for example. Results are the output given for the company, but as important as them, is also the evaluation and impact assessment. Evaluation can be made with *documentation of experiments*, which is introduced in the tools chapter 5.5.1.
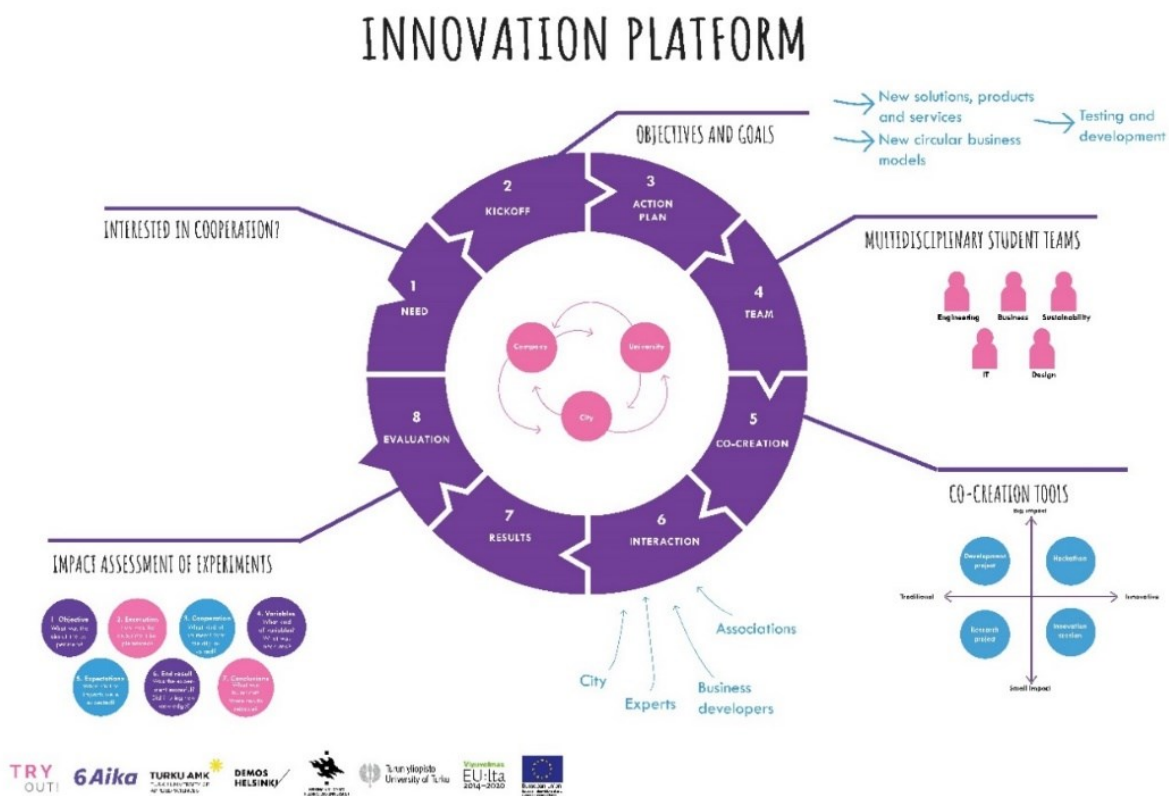
Picture 2. Innovation platform by *TRY OUT!* (TRYOUT!, 2023).

The innovation platform was tested in real life cases during the *TRY OUT!* -project to ensure, that the process is valid, but development of the learning environment has been ongoing ever since. To be sure that the innovations and solutions learning environment provides to the companies, the research group has taken a definition of a sustainable circular economy as a main principle.

Besides working with companies through projects, the research group is responsible of teaching circular economy for bachelor and master students in Turku UAS. The studies include both lectures, case examples and project work with real companies' real sustainability challenges.

Besides working with student company cooperation, the research group has been facilitating ecosystems in circular economy field. Ecosystem is seen as stakeholder group consisting of companies, organizations and researchers that

work together to achieve a change in some theme, for example in circular textiles in Finland or sustainable and responsible maritime industry.

A master thesis about the facilitator's role was conducted in 2021. Maarit Jaakola, also a member of the research group, examined the circular economy business models research group's project from the perspective of building trust in sustainable and responsible maritime industry ecosystem. She found out the facilitator's crucial role in the process. The facilitator is not usually recognized as an ecosystem driver, but Jaakola's research showed that this project's facilitators succeed in building trust, creating continuity, and designing atmosphere where the project stakeholders could concentrate on deepening their knowledge and sharing ideas. (Jaakola, 2021)

2 Introduction to research

The research background is gathered to this chapter. The frame of reference gathers the supporting themes where the thesis leans. The research questions state the borders to the research. The research process is introduced as well as the used research methods.

2.1 Frame of reference

The frame of reference is formed from three layers that are important when working with the sustainable shift. They are presented in figure 4. The first and most important premise is to set up goals that support the safe and just space for humanity. Safe and just space for humanity is described more carefully in the theory chapter 3.2. In the real world, this means for example that the research group is taking the United Nations Sustainable Development Goals (SDG's) into consideration in all actions, decisions and plans. The SDGs are introduced in the theory chapter 3.2.

The next premise is the interaction between organizations, stakeholders and research group and students. Interaction has increased in the centre of every successful project of the research group. Shifting from linear economy to circular economy, openness, knowledge sharing and experimenting are important. Interaction and communication are needed to build the fragile trust in the projects. Service design has a mindset and methods for that, and they are introduced in the theory chapter 3.3.

On the top of the frame of reference are tools and methods that are used to facilitate and support the sustainable shift. They are the instruments for the change.

Figure 3. Frame of reference (Inka Mäkiö, 2023).

2.2 Research questions

The aim of this thesis is to gather and introduce all the tools and methods the Circular Business Models research group of Turku University of Applied Sciences is using to help organizations to shift towards more sustainable world. To achieve the aim, there are two research questions for this thesis.

What kind of tools are in use to help the companies to shift circular?

What kind of processes in the projects lead to developing these tools and methods, and how to use them?

The first one is asking what kind of tools and methods for helping companies and organizations to shift circular economy are in use in Circular Business Models research group in the Turku University of Applied Sciences. To understand the global situation where companies and organizations need to act, the author of the thesis introduces theory about urgency and future thinking as well as existing planetary boundaries and new sustainable economic models in theory chapter 3.2. The background of the common working process of the research group is introduced in chapter 1.2.

The second question is asking in which projects these tools and methods were developed, for what use and how they are used. This is answered in the fifth chapter, which introduces the tools. The answer is mirroring the theories of design

thinking, service design and innovation. To conclude both of the questions, some tools are also developed further to guarantee their usability in the future.

2.3 Process chart

The process of this thesis is following the typical research process, which is presented in the figure 5. The aim of the thesis is not to create new tools and methods, but to examine and test those that are already developed by research group. Some tools are developed further, and their developing process is introduced in chapter 3.3. The research process consists of five phases that mostly follow each other's.

First comes the theoretical or contextual phase, where the topic area is studied and the tools and methods to the Purse are selected. Next comes the technical phase, where the tools and methods are examined and opened. Third one is the empirical phase, where the tools and methods are tested and observed in use. Then the paths of the Purse and the research apart. For the Purse, the following phase is dissemination, that means translation into Finnish/ English if decided, layout design and publishing. For the research path the last step is the implication phase, where the conclusions, recommendations and limitations take place. This phase also defines the concept of the Purse.
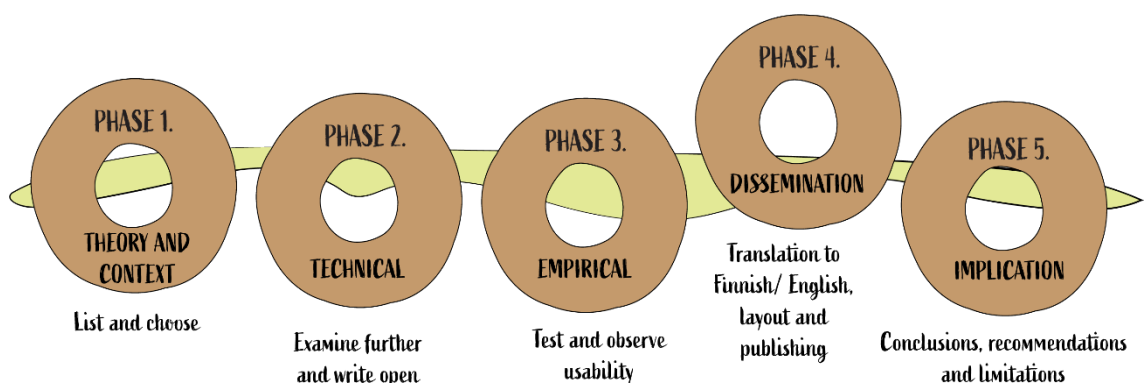
Figure 4. The process chart of the thesis process (Inka Mäkiö, 2023).

2.4 Research Methods

Research methods used in this thesis are first desk research and interviews – both individual and group interviews – to get best knowledge of case studies and tools and methods that are already in use. They are followed and altered with active research and observation to test and develop further the tools and methods for the Purse.

Active research

Active research is method, where the researcher actively takes a role in developing. In active research, researcher can provide analytical input and normative orientations and effect on transition management. *Active* research is different than *action* research, which implements the collaboration between the researcher and the client to diagnose and solve the problem together. (Krishnaswamy & Satyaprasad, 2010.)

Wittmayer and Schäpke have identified five roles in active research, and they are reflective scientist, change agent, knowledge broker, self-reflexive scientist and process facilitator. **The reflective scientist** from these five roles is closest to what is understood as 'researcher'. It includes collecting, analysing, interpreting and reporting data from an observer point of view. (Wittmayer & Schäpke, 2014.)

The change agent takes an active role in the research process trying to address real-world problems and motivate and empower participants. The change agent becomes part of the problem and the solution and highlights the importance of the process as a site of trust building, motivation, and empowerment. (Wittmayer & Schäpke, 2014.)

The knowledge broker is a researcher who wants to take an active role in sustainability transitions. They provide a space for critical reflection and brings along the sustainability context, system complexity and social aspects. (Wittmayer & Schäpke, 2014.)

The self-reflexive scientist makes the researcher as part of what is been researched. Then the researcher is at the same time a research instrument. The self-reflexive scientist is an essential part of process that is studied. (Wittmayer & Schäpke, 2014.)

The fifth role Wittmayer & Schäpke are presenting is **the process facilitator**. The process facilitators are actively facilitating the process, including the participatory tools and methods, facilitating the actions, and taking the future oriented approach in the process. (Wittmayer & Schäpke, 2014.)

The author of the thesis is using "the process facilitators" role collecting and developing the content for the Purse and the thesis. In the parts where the tools and methods are tested and analysed, also the role of "self-reflexive scientists" is used.

Desk research

Desk research is a method, where data is collected from existing resources. Desk research is a review of what has been done before and the data that is used then, is called secondary data. That means that someone else has produced it. The name comes from the fact, that the technique is mainly done by sitting at a desk. (Moore, 2006, p. 106.)

The desk research contains literature review, internet searching or analysing already existing statistical data. Literature review is the most common desk research, and it contains various published materials like books, articles, reports, studies and other similar documents. (Moore, 2006, p. 107.)

Desk research can be for quantitative or qualitative purposes. The descriptions vary and the researchers are not like-minded about their meanings. In quantitative research the aim is usually used to clarify pre-set hypotheses by arranging experiments and collecting measurable data that can be managed in statistical form. Qualitative research is comprehensive research, where the findings base on researchers' observations and conversations, and the results

that are expected can be surprising and unexpected. (Hirsjärvi et al. 1997, p. 140-164.)

Important factors when choosing the materials for desk research are the authority and reliability. The materials that are used, must be trustworthy and they need to be clear for what purpose each material has been chosen to the research. It is critical to compare different materials and find and analyse the differences and similarities. (Moore, 2006, p. 112.)

Interview

Interview is an effective method to gain information because it is made in interaction with the interviewees. Interview tells what people think, feel, believe, and remember. In the interview, the one who is making the interview has the lead of the conversation. The interview has goals, and the aim is to get reliable and valid information. (Hirsjärvi, et al. 1997, p. 208.)

Interview types can be divided roughly in two different main types. The other end is highly structured interview, where pre-made questions are asked in same specific order from all interviewees. The other end is unstructured, completely open form interview, where is usually just a theme and the conversation flows around it freely. (Hirsjärvi, et al. 1997, p. 208.)

Interviews can be made for individuals only, in peer interviews and in group interviews. These can be used together to complement each other. Individual interviews are a way to ask specific questions and get information for specific topics. The group interview is an effective method, because it is possible to gather information from many people at the same time. The benefits in group interview are, that the group can recall important factors and fix misunderstandings. The disadvantages may be, that some people dominate the conversation, and all the voices are not heard. (Hirsjärvi, et al. 1997, p. 211.)

Observation

Observation is a method to gain information of what is really happening. The benefit of the observation is, that it gives immediate and straight information of how individuals, groups or organizations work and act. Observation is a method to make research of interaction and in different and changing situations. (Hirsjärvi, et al. 1997, p. 213.)

The biggest disadvantage of observation is, that the observer is always affecting to the situation and sometimes even disturbing it. Observation is roughly divided to two. The other side is systematic observing, where the area and theme are strictly defined, observing is systematic and outlined and the observer is outsider in the situation. The other side is participatory observing, where the observer is taking part in action and the situation is free formed. (Hirsjärvi, et al. 1997, p. 214.)

3 Theory

This chapter introduces the theory behind the thesis. The theories of future studies are introduced first, followed by the idea of the new economic models and theories of sustainability. Then the theory of service design thinking is followed by theories about open access and licencing.

3.1 Uncertainty and the future studies

The concept of uncertainty is widely studied and the forerunner in the field was Milliken already in 1987. He presents three stages of uncertainty, which are "*uncertainty in the state of environment*" where the organizations operate and that comes outside*, "inability and a lack of resilience"* to response the uncertainties effecting from outside and the "*uncertainty in response and understanding*" the alternatives and the value and impact of them (Milliken, 1987).

When uncertainty is a starting point, different methods can help building up responsive culture and increase resilience in the organization. In Lean thinking, introduced by John Shook, the change starts, not from changing thinking, but changing the behaviour. The old, or traditional way of thinking in the organizations is, that in need of change first thing is to change thinking to change behaviour. But Lean thinking introduces a new model, which suggests changing behaviour to change thinking. Then the way things are done start to affect the values and attitudes, and by changing them also the culture changes. (Shook, 2010).

Future studies and understanding of the change often start from the past, following forms and rhythms that repeat through the history. Professor of futures studies in Turku School of Economics at the University of Turku, Markku Wilenius, bases his future thinking on Kondratiev's wave theory. Kondratiev formed his theory in the beginning of 1920's, and it starts from the hypothesis of 40 to 60 years long waves in economy. The theory sees that economy and the whole society works in cycles, waves, and patterns. Kondratiev, and later also Wilenius, uses several indicators of economic activity like prices, work wages, foreign trade,

raw material production, consumption, and bank savings to indicate the change. (Wilenius, 2017, pp. 34-43.)

According to Wilenius, he sees that the sixth wave has already started in 2010 and humankind has ten years to shift on the track to stay on this wave. Otherwise, it will be too late and there is no recovering from the damages. He has gathered the necessary changes in five points, which are energy system, circular economy, new technologies, politics and long-term thinking. (Wilenius, 2017, pp. 48-51.)

First, the energy system of the world needs to change totally from using fossil fuels to not only new technologies and innovations, but to new systemic solutions and mindset. Secondly, he states that circular economy must be adopted to economics and everyday life. Wilenius sees that circular economy can bring the revolution in people's understanding, when they learn how materials, energy, and human capital flow through society. (Wilenius, 2017, pp. 206-211.)

The third point is to take full use of new technologies that already exist. Wilenius sees that the fourth industrial revolution, which is an idea made by Karl Schwab, is an integral part of the sixth wave. Industry 4.0 has adopted Internet of Things, artificial intelligence, and machine learning. The fourth change Wilenius sees is in the system of political decision-making. He sees that instead of political from election-to-election thinking, decision making must adopt long-term goals. (Wilenius, 2017, pp. 211-215.)

The fifth and last point Wilenius makes is that businesses must adopt long-term thinking as well and get rid of quartal and profit-to-owners thinking. Wilenius sees, that future entrepreneurs also steer humanity towards sustainable future and companies will abandon industrial ways and adjust more human organizational culture. Abandoning too hierarch structures increases innovation. The history of innovations shows that most of them are made by ordinary people, not geniuses. (Wilenius, 2017, pp. 215-218.)

3.2 Planetary boundaries, sustainable economic models and the SDGs

Two new ways for the economics to response to the environmental change are introduced next. Other model is labelled as circular economy and it looks for new ways to do business without harming the future lives. The other one is labelled as doughnut economy, and it is more a way for systemic change, a new mindset, and a framework to take into consideration in all decision-making. Both are doable only within the limits of planetary boundaries, and they are therefore introduced first. The skills needed for the more complicated world are presented as well as The United Nation's Sustainable Development Goals.

Planetary boundaries

The concept of the planetary boundaries was introduced 2009 by a group of scientists led by Swedish scientist Johan Rockström from Stockholm Resilience Centre. The aim of the planetary boundaries is to define the environmental limits where humans can safely live and operate. Rockström and his colleagues divide the Earth systems into nine processes that control the stability and resilience. They are the climate change, ocean acidification, stratospheric ozone depletion, interference with the global phosphorus and nitrogen cycles, rate of biodiversity loss, the global freshwater use, land-system change, aerosol loading and chemical pollution. (Rockström, 2009)

The picture 3 below illustrates with yellow the zone of increasing risk for humanity. There is a risk in changes in climate and land use. High risk boundaries are illustrated with orange. The humankind is pushing over the limits with biodiversity loss, novel entities, and biogeochemical flows. The green shades in the middle are below the boundary limits and still on safe zone. On atmospheric aerosol loading or biodiversity intactness there is not yet a quantified measuring system. (Rockström, 2009.)
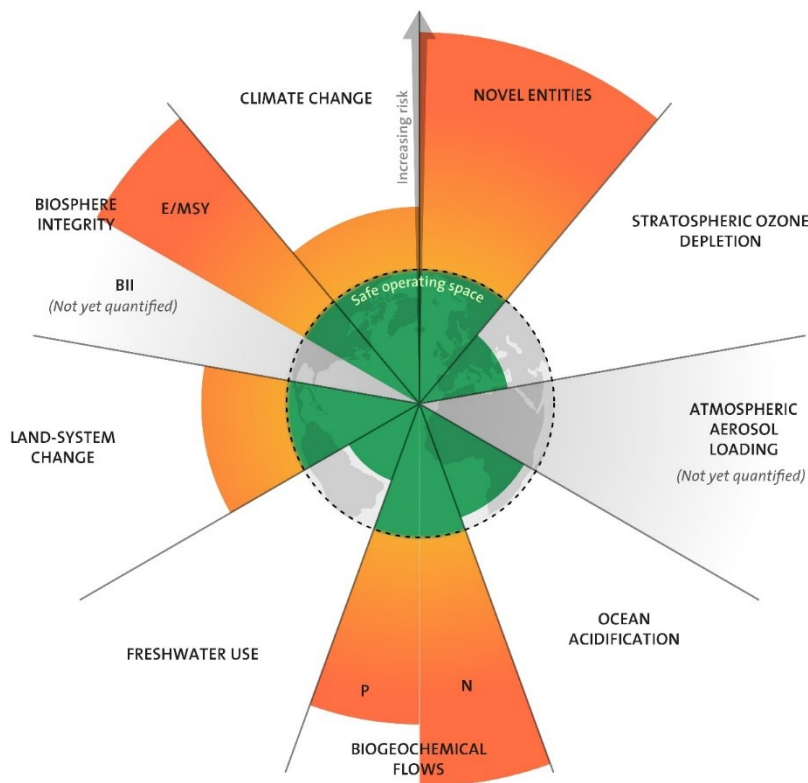
Picture 3. Planetary boundaries (Azote for Stockholm Resilience Centre, based on analysis in Persson et al 2022 and Steffen et al 2015).

Circular Economy principles

The circular economy (CE) is an economic model, and it works with the rules of growth, monetary values, and human wellbeing as other economic models. The main differ is in the mindset when nature and human labour are not seen just as a resource, and materials get more value from decoupling and rethinking. CE is a systems solution to tackle the global environmental challenges. (Ellen Macarthur Foundation, 2023)

The CE is based on the three principles of designing out waste and pollution, keeping products and materials in use, and regenerating natural systems. All principles are driven by design. The difference between different economical models and connection to CE principles are presented in the figure 5. The first principle, designing out waste and pollution from a products lifeline is a starting

point. The next principle is to circulate products and materials at their highest value as long as possible. The third principle is to regenerate natural systems and shift the focus of an industry or company from extraction to regeneration. (Ellen Macarthur Foundation, 2023)
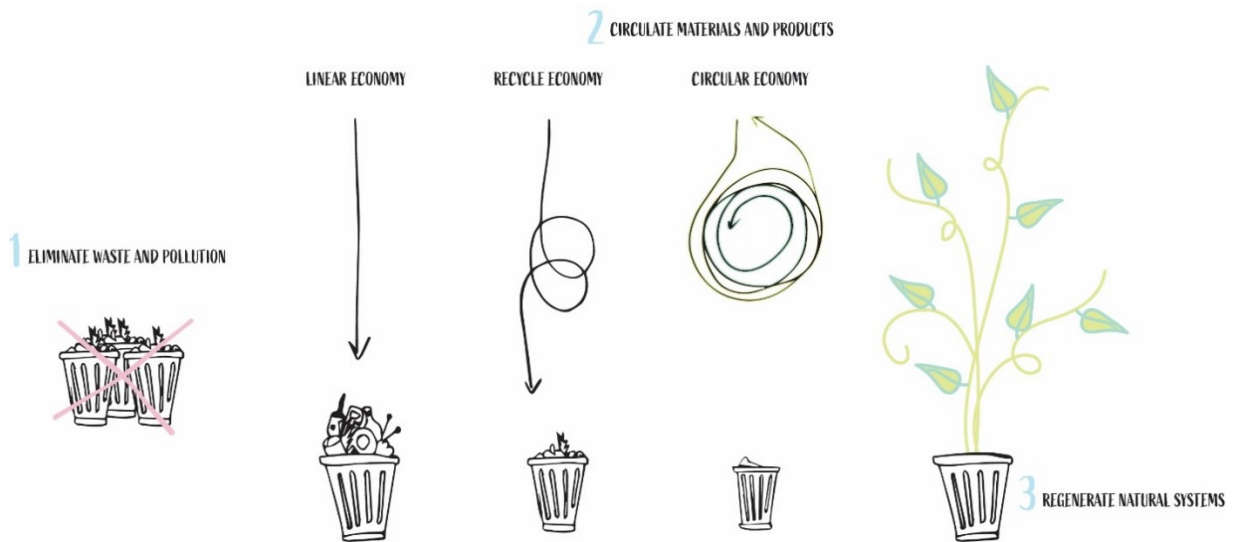
Figure 5. Circular economy principles by the author, modified from Circular Flanders (Inka Mäkiö, 2023).

The Finnish Innovation Fund Sitra has been a forerunner in Europe to support transition to a circular society. Sitra has identified already more than 120 companies from Finland, who are leaders in different circular business models. Sitra divides CE business models to five (Sitra, 2021).

In Sitra's division, the first circular business model is product-as-a-service -model, where the business forms from services instead of products. The second is renewability, which means using renewable and recyclable materials as well as renewable energy in product design and manufacturing. Third is sharing platforms, which will lead increasing the capacity to use goods and resources and extending their life cycles through digital platforms as a result of renting, selling, sharing and reuse. The fourth is product-life extension by using products according to their original purpose for as long as possible or enabling several stages of reuse through maintenance, repair and refurbishment. And the fifth one is resource efficiency and recycling material and energy efficient solutions, and

the collection and reuse of products and raw materials that have reached the end of their life cycle. (Sitra, 2021)

Sustainable circular economy

The research group follows the definition of a sustainable circular economy, which is defined in a research project called *CICAT2025*. It is remarkable to notice, that the definition includes the idea, that not all actions that could be called circular economy business, are sustainable.

"Sustainable circular economy (CE) means reducing the use of natural resources, closing material, energy and nutrition cycles, and retaining the value of products, materials and resources as long as possible. Sustainable CE is implemented in the actions of companies, cities, other organizations and citizens and the promotion of sustainable CE requires comprehensive collaboration across different societal levels. When promoting sustainable CE, economic, social and ecological consequences for different stakeholders should be evaluated and considered currently and across generations, while staying within global environmental limits in the long term." (CICAT2025, 2023)

Skills of circular economy experts

The report by the *Association of Nordic Engineers* (ANE) and their working group on circular economy presents the skills and competences that are needed by engineers, and science, technology, engineering, and math professionals (STEM). By creating the circular economy competence framework ANE has wanted to highlight the skills that are needed for engineers and STEM professionals to implement their technical and analytical problem-solving skills to create circular solutions. These skills are divided technical and analytical skills, and cross-cutting skills as well as general knowledge and deep knowledge. The skills are illustrated in the picture 4.

STEM skills are based on the awareness and mindset of the planetary boundaries and circular economy principles. The mindset and the competencies are general knowledge. The technical and analytical competences include for example in product design strategies the understanding of products lifetime and multiple circles. In competence for business models, a new idea of value creation must be seen. As cross-cutting interdisciplinary skills are mentioned for example communication and collaboration. For deep knowledge report points out specialized skills for example about life cycle analysis, recycle and energy expertise. (ANE, the Association of Nordic Engineers, 2021, pp. 16-27.)
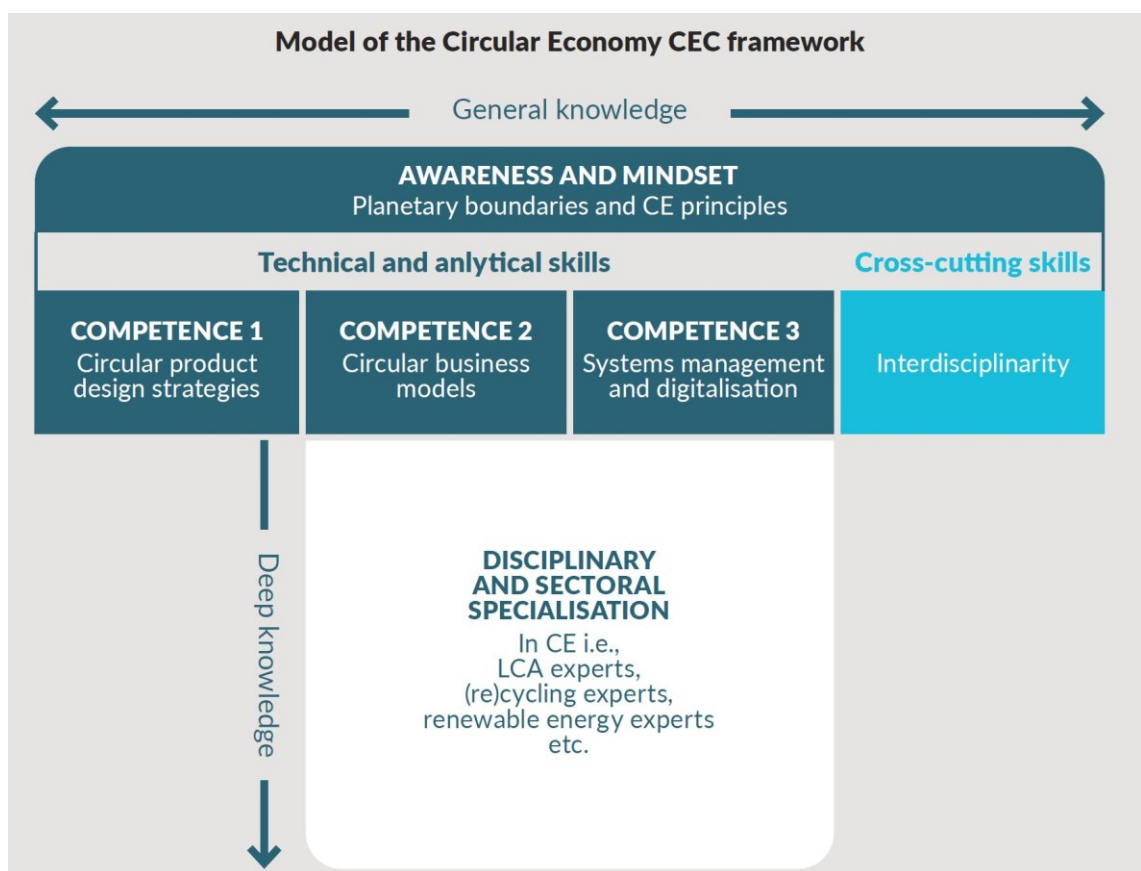
Picture 4. The Circular Economy Competence (CEC) framework (ANE, the Association of Nordic Engineers, 2021).

Doughnut economy

The doughnut economy is a model that considers both the planetary and social boundaries. It is invented by economist Kate Raworth in 2012. The name comes from the illustration, seen as picture 5 where essential life supporting planetary systems (the same nine planetary boundaries as presented in the picture 3) are seen on the outside of the doughnut and twelve societal essentials, like water, food, education, equality, and equity are in the inside of the doughnut. Safe and just space for humanity is inside the green doughnut. (Raworth, 2021)
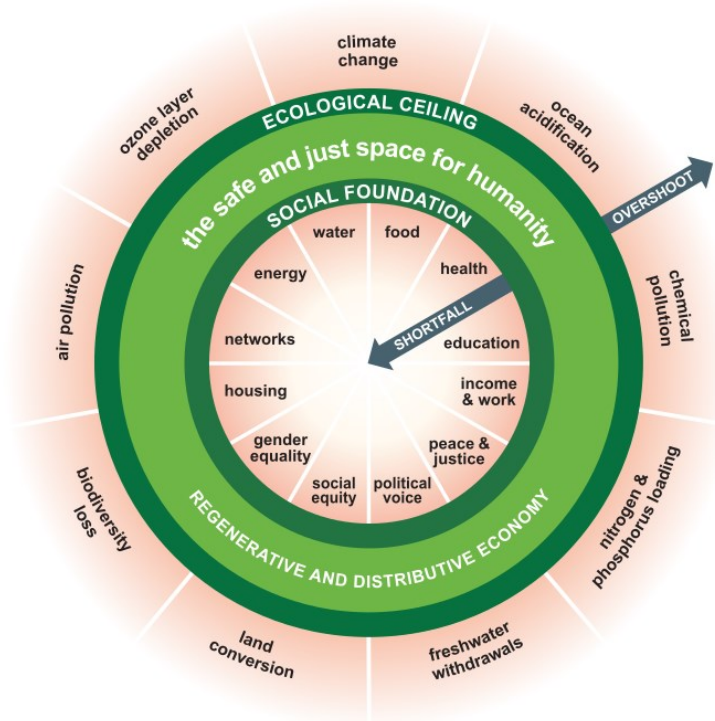
Picture 5. The Doughnut of social and planetary boundaries (Raworth, 2021).

The doughnut economy requires a change in thinking and behaving more than circular economy. In her next book Raworth states there are seven ways to think differently on the 21st century. Doughnut is on its best distributed on a local level in cities or municipalities, and the mindset starts from redesigning organizations. Doughnut economists have identified five key design aspects that help organisations to become regenerative and distributive. The key aspects that need

to be re-evaluated are the company's purpose, networks, governance, relationship to ownership and finance. The new ways of thinking and the new design traits are connected to be The Doughnut Principles of Practice (Raworth, 2017).

The principles are:

1. **"Embrace the 21st century goal**." This stands for aiming to meet the needs of all people within the planetary boundaries. In practice this means aligning the organization's purpose, networks, governance, ownership, and finance with the goal that is ambitious.
2. **"See the big picture."** This principle stands for recognizing the roles and synergies of households, communities, markets, and municipalities in transforming economies. Also, it is noticeable to ensure that finance is serving the work, not driving it.
3. **"Nurture human nature**." This principle stands for diversity, participation, collaboration, reciprocity, trust, and ecosystems.
4. **"Get savvy in Systems."** This principle encourages to think in systems for experiment, learning, evolving and continuous improving and development, and look for dynamic effects, feedback loops and tipping points.
5. **"Be distributive."** This calls out the openness in design and actions, shared value creation, equality, and equity.
6. **"Be regenerative."** Principle of regenerativity means working together with living cycles, and share, repair, reduce consumption and take care.
7. **"Be agnostic about growth."** Aim to thrive rather than to grow. This last principle stands for decoupling and letting go the idea of continuous economic growth. Thriving means spreading horizontally rather than scaling up in size.

There are other methods and tools to implement the doughnut, like *Dimensions of the four lenses*, *City Portraits* and *Doughnut Unrolled* to help initiatives to get started. The tools guide companies, cities and countries to take planetary

boundaries and societal essences into consideration when planning actions and making decisions. (DEAL, 2023)

The sustainable development goals

The sustainable development goals (SDG's) are United Nation's (UN) action points for peace and wellbeing for people and planet. They are aligning the 2030 Agenda for Sustainable development and call both global North and global South to action in partnership for a better future. These 17 SDGs were adopted in UN Development Summit in New York 2015. All 17 goals include more specific targets and several indicators to evaluate the progress in each target. SDG's progress is reported annually by UN Secretary General. The progress is based on global indicators and the data is produced by national statistic systems and regional data. (United Nations, 2023)

The SDGs are in the first place a guideline for nations, but many educational and research institutes have taken SDGs as their way for introducing their values and evaluating their impact. For example, Finland's sustainable development strategy from 2022 pledges to make changes in six fields to enable sustainable development goals. Those fields are derived from the SDGs. They are 1) economy and work that promotes well-being and sustainable consumption, 2) education, competencies and sustainable lifestyles 3) well-being, health and social inclusion 4) sustainable energy system 5) food system that promotes well-being and 6) forest, water and land use, that strengthens diversity and carbon neutrality. (Sitoumus2050, 2023)

In higher education institutes, usually there may be a notification of which SDGs are taken into consideration in project description or study programs or courses. The SDGs are important guideline also for the research group. The implementation is still in progress, but the aim is to choose the SDGs that are the most suitable for the research group's projects and courses and follow how they are impacted. One tool in the Purse is specifically made for following the SDG impacts.

Schroeder and partners have been studying to identify the relationship between circular economy practices and SDG's. Their study shows that circular economy can contribute to many SDG's directly and help to achieve the goals, like for goals of water and sanitation or electricity. There are also synergies that can be created between SDG's and circular economy practices, like for strengthening global partnership. Their study suggests that circular economy can be used to find ways to overcome some of the problems that SDG's try to reduce, such as decent work and human health. The SDG's and their relevance for circular economy are presented in the table 1. (Schroeder et al. 2019.)

Table 1. SDG's and their relevance for circular economy (Schroeder et al. 2019).

SDG	SDG name	relevant for CE*
1	End poverty in all its forms everywhere	indirect
2	End hunger, achieve food security and improved nutrition and promote sustainable agriculture	indirect
3	Ensure healthy lives and promote well-being for all at all ages	weak / no link
4	Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all	weak / no link
5	Achieve gender equality and empower all women and girls	weak / no link
6	**Ensure availability and sustainable management of water and sanitation for all**	**direct**
7	**Ensure access to affordable, reliable, sustainable and modern energy for all**	**direct**
8	**Good Jobs and Economic Growth**	**direct**
9	Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation	contributes to CE
10	Reduce inequality within and among countries	weak / no link
11	Make cities and human settlements inclusive, safe, resilient and sustainable	indirect
12	**Ensure sustainable consumption and production patterns**	**direct**
13	Take urgent action to combat climate change and its impacts	contributes to CE
14	Conserve and sustainably use the oceans, seas and marine resources for sustainable development	contributes to CE
15	**Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reserve land degradation and halt biodiversity loss**	**direct**
16	Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels	weak / no link
17	Strengthen the means of implementation and revitalize the global partnership for sustainable development	cooperation opportunities for CE

3.3 Design thinking and service design

"Design thinking relies on our ability to be intuitive, to recognize patterns, to construct ideas that have emotional meaning as well as functionality, to express ourselves in media other than words or symbols." says Tim Brown, the CEO of the famous design company IDEO in his book *Change by Design*. He says design thinking is a set of principles applied by diverse people to solve wide range of problems. Design thinking is often on it is best with some boundaries, and criteria for overlapping themes that is widely used is the triangle of *feasibility, viability, and desirability*. The difference between a designer and a design thinker is, that designer will solve those three themes, but design thinker will bring them into balance, states Brown. (Brown, 2019)

The centric principles of design thinking and service design are presented in the book called *This is Service Design Thinking* by Stickdorn, Lawrence, Hormess and Schneider. Stickdorn and partners define service design principles to be "human-centred, collaborative, interdisciplinary, iterative approach which uses research, prototyping, and a set of easily understood activities and visualization tools to create and orchestrate experiences that meet the needs of the business, the user and other stakeholders". (Stickdorn et al, 2018)

Christian Bason's and Robert D. Austin's article in Harvard Business Review gives examples from a study with leaders of design thinking processes. The outcome from the article is, that leaders who commission design thinking projects must be coaches who inspire their teams to achieve success, holding hands, when necessary, but drawing back when a team hits its stride. The process can be hard for employers, and they can feel frustrated in the fuzzy process. The design thinking process involves an outbreaking discovery of what kind of change is needed. (Bason, 2019)

Process of Service Design

Service design always follows a predefined process. Stickdorn and partners notice in their book, that there is a wide variety of different design processes that have been studied and published. They differ in wording, or the number of phases, or the tools or methods that are recommended to use, but they always share the same mindset and same design thinking principles. A famous and often used process chart is the *Double Diamond* by Design Council, introduced in figure 6. (Stickdorn et al. 2018, pp. 84-90.)

Brown presents his design process where the process is an idea of overlapping spaces where the innovation happens, as shown in figure 6. They are the space of inspiration, where the problem or the opportunity seeks to search for solutions, the space of ideation, where the development and testing happens and the space of implementation, where the results get validated. (Brown, 2019)
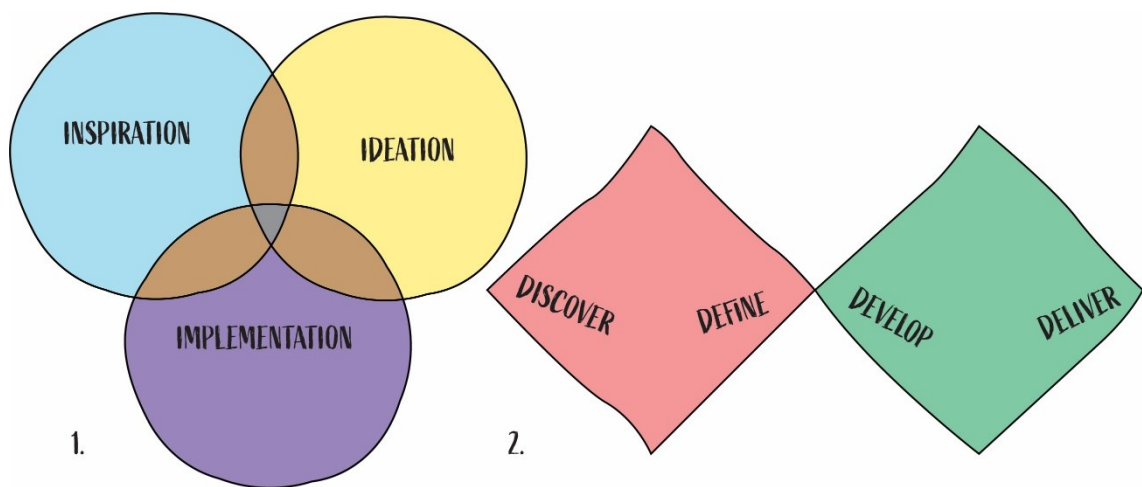
Figure 6. 1. Design process by Brown and 2. Double Diamond by Design Council (Inka Mäkiö, 2023).

Facilitator as a Key Player

Stickdorn et al. note a difference between tools and methods. Tools are concrete models like templates and spreadsheets, which follow specific structure. Methods describe more how to create and work in projects and what kind of protocol to

follow to get forward. Their book states, that service design is not about using tools, it is about changing reality. (Stickdorn et al, 2018, p. 37.)

" *Without a process, mindset, an even common language, those tools lose much of their impact and may even make no sense."* As Stickdorn and partners state in their book, the tools and methods alone cannot make any impact. A facilitator works simultaneously in three levels. They facilitate the process by offering information, tools, methods and gathering the results. They facilitate the group by motivating, engaging, and handling difficult situations. And they facilitate the individuals, helping them to be more emphatic, analytic, creative, sceptical or whatever is needed for the process. (Stickdorn et al, 2018)

Sometimes a facilitator can help individuals to develop their skills and perspectives. To be able to work well, a facilitator needs several success factors. They need good interactions skills, the consent from the group by building trust, gain a status that allows to take the process forward but also ask stupid questions, and neutrality, which does not mean they could not use their knowledge, but that they need to remain fair. (Stickdorn et al, 2018, p. 392.)

Systemic co-design

Systemic co-design is an emerging study field. Design can be seen as a possible approach to sustainability and inequity problems because it can work with complexity and uncertainty. Especially co-design allows mechanisms for searching for the solutions together. Wina Smeenk is professor in societal impact design in The Netherlands. She has modelled an iceberg model taking from social sciences and design studies for a basis of a co-design iceberg including a systemic perspective. Her iceberg is visualised in picture 6 (Smeenk, 2021).

The iceberg model is a system thinking model, which refers to the fact that only 10% of the icebergs can be seen and the rest 90% are below the surface. It is used to demonstrate the parts that people are aware (above the surface) and what they are not aware of (below the surface). Icebergs have been used to

describe writing process, culture and widely in social sciences and design studies. (Smeenk, 2021, p. 36.)

The systemic co-design iceberg is seen in the picture 6. The left side expresses the individual side of the change process, and the right side expresses the collective side. Below the surface are systemic perspective and frame of values and mechanisms for change combinations. They base on the "sphere of life" mechanisms, which are being personal, private, public and political. Different values are combined with different mechanisms, and these formulate the frames, which are in the centre of the iceberg. These frames work both in individual and collective behavioural. Smeenk sees, that the self-awareness and self-reflectiveness are starting points in systemic change. (Smeenk, 2021)

On the bottom left are stakeholder's own personal experiences (PE) from first person perspective. For making the change it is crucial, that the stakeholders are willing to see, hear and understand other stakeholders' perspectives and feelings. On the right bottom is the collective experience, feelings, and dreams in second person perspective, labelled with (S) sensitivity that the individual needs to show. Above water are the desired alternative futures. They are expressed in third person perspective and for individuals, the self-awareness (SA) and empathy are important here. On the collective side the stakeholders become emotionally interested (EI). (Smeenk, 2022)
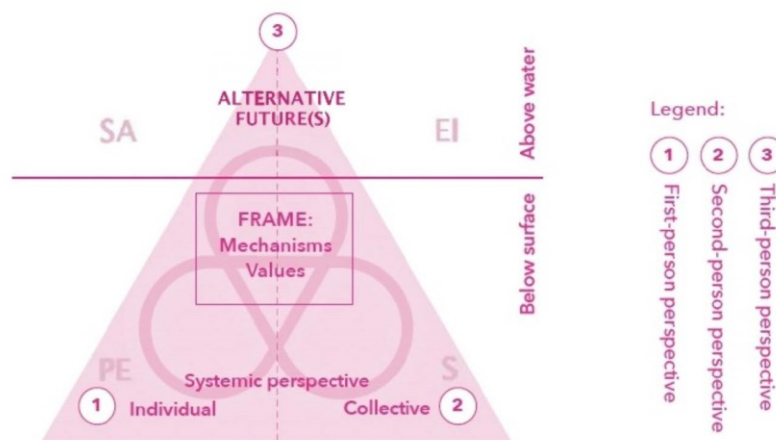
Picture 6. Systemic co-design iceberg model (Smeenk, 2021).

The systemic co-design iceberg can be used to identify individual and collective latent values and mechanisms for a multi-stakeholder coalition. Identifying these hidden values can lead to value creation and systemic change. The iceberg can be used as a starting point for a stakeholder's systemic change, and it can be seen as a systemic co-design strategy beyond methods. Smeenk criticizes, that the model is not yet widely used in case studies, but it is a way to express the emerging field of systemic co-design. (Smeenk, 2022)

3.4 Publishing and open access

Open access

Open access (OA) means free access to information and unrestricted use of electronic resources for everyone. Open access is defined in the Berlin Declaration on Open Access to Knowledge in the Sciences and Humanities in 2003, to ensure that research results are openly available. The need for this kind of arrangement started with a notice, that internet had fundamentally changed the realities of distributing scientific knowledge. The Berlin Declaration urges to unrestricted online access to peer-reviewed scientific research papers to read and re-use. The only limitation to use is, that the author must be mentioned. (Berlin Declaration, 2023)

The United Nations Educational, Scientific and Cultural Organization UNESCO states in their open access policy, that almost any kind of digital content can be OA. That includes texts, data, software, code, audio, video, images, and multimedia. OA can also apply to content like music, movies, and novels. (UNESCO, n.d)

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To publish any material online, it is good to use licensing. With the materials that come to The Purse, the license that is decided to use is CC BY-NC-SA, seen in

the picture 7. Creative Commons license BY-NC-SA includes the following elements:

- BY - Credit must be given to the creator.
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Picture 7. Creative Commons license BY-NC-SA (CreativeCommons, 2022).

4 Working process

This chapter follows the process of this thesis, as presented in the figure 5. The process chart of the thesis process, which is presented in chapter 2.3. This empirical chapter describes how the tools were chosen to the Purse and how they were tested and observed in use. This chapter enlightens the choices that were made during the process.

4.1 Theory and context
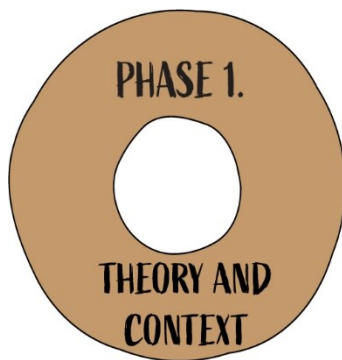
The Circular Business Models Research group has a long history of helping companies in transition towards sustainable operations, as explained in the background chapter 1.2. Co-operation with companies and organizations can be made by developing the business itself, demonstrating new methods, practicing new ways to operate, making quick trials or some other innovative method. The author of this thesis has not been developing all the tools presented in the Purse, but she has been using many of them with the research group. The need to provide open access to tested tools and methods has been increasing throughout the years.

In the first phase of the process also the important theory and research methods were chosen. Because the sustainability is the background for all the research group's work, it came necessary to tight the thesis to relevant sustainability theories. Open access and licensing were on the key drivers to the whole work.

And the theory about service design as methodological backbone for tools and facilitation was needed.

The process for the thesis started in December 2021 with setting up the first versions of the research questions and a group interview for the research group. The research group consists of twelve members whom some have been in the group for more than ten years, and some joined to the group after the process started.

In the first interview in December 2021, the author of the thesis introduced the idea of the Purse and showed a preliminary list about the tools she could recall. The research group members filled the missing information, like in which projects the tools were developed and who should be interviewed about their developing project. The tools and methods were listed as well as the origin of them. Members of the research group had changed from year to year, so the group interview was a good presentation for the newcomers to get to know better the working methods of the research group.

After the first interview the author examined the tools that were listed. Some tools were left out, if they were developed in some already ended project and had not stayed in use. It was noticed in the interview, that many tools and methods that are in use, are developed by someone else than the research group and are in general use, for example many ideation and research methods. They are noticed in the Purse only if the research group has made a publication where they are presented. For example, the *Methods for Circular Economy Teaching* which is introduced in the ideating phase chapter 5.4.2, contains a list of common ideating tools such as *Brainstorming*, *SWOT, Yes, and..* and *Six hats*.

For example, the *Telaketju*-projects have used many business developing tools, like a value map, an experience triangle, and a circular economy business model canvas. They are interesting tools and functioning well, but they were not developed in the *Telaketju*-project, or they are not published by the research group.

In this thesis process, as quite often, first came the need and that was followed by the research. The research questions raised from the need and frustration. The way of working with the companies is settled and project work is general way to work in universities of applied sciences. Still, through the years several people in several projects have developed several tools and methods, which have taken lot of time, hard work, and experiments. This work should be valuable and impactful, not wasted after the projects come to an end. Publishing the tools and methods would increase the usability of the tools, make them memorable to the research group themselves and guarantee the open access to project results that are done with public funding.

When the author was examining the tools, she was trying to solve what tools and methods were in use, are they usable, how they are used, and could they be used better. One principle in choosing the tools for the Purse was, that the tools are published, or they are planned to be published somewhere online. With some already published tools the CC license was already in use, but with some other, there has not been a thought about it. The *Documentation of experiments* was the first tool to be licenced already during the project in 2019. The templates made in CICAT2025 -project like *Strategy for interaction, Research publication survey* and *Impact plan for policy briefs* were licenced 2021.

One key idea that the author was examining was, that what makes precise these tools suitable for circular economy or sustainable development purposes. The sustainability aspects are not always built in. That raised a question if it should be somehow so in the future. With tools that are guiding to circular economy or sustainable processes, like *Understand the carbon footprint* of *SDG evaluation process,* it was obvious that the sustainability is implemented in the tool. But for example, *Communication plans* can be used anywhere, and they do not include sustainability viewpoint.

The tools that were chosen to the Purse, are introduced briefly in the table 2. More detailed descriptions of the background, development and use are in chapter 5. The author's thoughts about the usage of the tools are found in chapter 6. The table shows if the tool or method includes sustainability point of view or

not. All the tools are developed in projects, where sustainability and circular economy have been in the centre.

Table 2. Tools and methods of the Purse (Inka Mäkiö, 2022).

Process phase	Name of the tool	Project	Increases sustainability
Understand	Understanding carbon footprint	CarbonWise	Yes
Understand	Understanding circular economy	Kiertotaloudesta liiketoimintaa	Yes
Define	Strategy for interaction and impact	CICAT2025	No
Define	SDG evaluation process	REDUCES	Yes
Research	Industrial symbiosis workshop organizer's workbook	Circwaste	Yes
Research	Research result documentation	CICAT2025	No
Ideate	Methods for Circular Economy Teaching	#circulareconomy	Yes
Ideate	Innovation camp manual	Resurssivirrat haltuun	No
Test	Documentation of experiments	TRY OUT!	No
Test	Guide for developing Product as a Service business	PaaS Pilots	Yes
Launch	Policy brief impact plan	CICAT2025	No
Launch	Communication instructions	from various projects	No
Launch	Social media instructions	CircHubs	Yes

4.2 Technical part
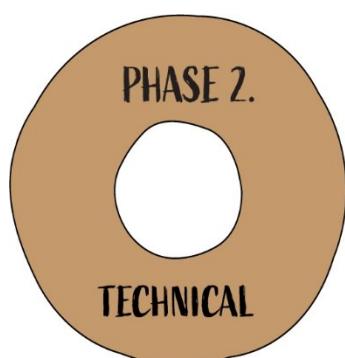
All the tools were not familiar to the author of this thesis, so the technical phase of the process required desk work, like studying project reports and publications as well as interviewing the developers. All materials were not published on the internet, so sometimes it was real detective work in old archives to clarify the developing process and the usage experiments.

During March to June 2022 the author made eight short interviews with research group members to clarify the development phase and usage of the tools. The interviewees were the project managers or those who had been developing and / or using the tools in projects where they were developed.

The second group interview took place in May 2022, where the chosen tools and the selection criterion were presented, as well as the feedback and guidelines for the Purse were gathered. For example, the importance of the open access publication and open access were mentioned as leading guidelines.

Those tools, which were already published, were written open. Most of the tools were already published. Only the *SDG evaluation process* was not published as a tool. Important viewpoints for all the tools were listed in the group interview. The points that the research group thought was necessary to bring up from the tools were:

- Introduce shortly the project where the tool was developed.
- Explain why or how the tools were developed.
- Where the tools have been used in that project and specifically later in other contexts.
- Who can use them and what is the interaction needed.
- How to modify them.
- How to use them and in what situations.
- How the tools support green and just transition.

4.3 Empirical part
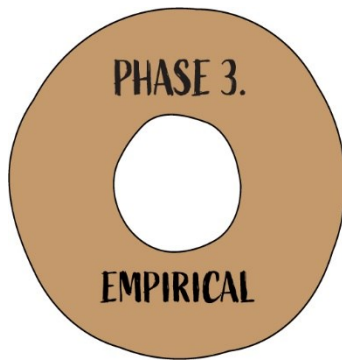
During the thesis process, the author of the thesis was also an active participant of the testing and developing process for some of the tools. During the desk work examining the tools, it came out that they were not as ready yet as they could have been. The testing and developing of these not yet ready tools is described in this chapter.

Testing and developing the tools at the same time came surprisingly important to some other projects that were going on at the time. For example, the *Strategy for interaction and impact* was tested in one universities of applied sciences circular economy networking project in September 2022. Clarifying the interaction targets and wanted impact together with the project members gave more insight to the project. At the same the author got valuable information about the usability of the tool and the tool's structure was developed after testing.

The *Strategy for interaction and impact* was tested in the research group's own projects with the stakeholders, but for example the *Industrial symbiosis workshop workbook* was tested with regional industrial symbiosis company coordinators across Finland between August 2022 and February 2023. Regional coordinators are designated bodies that promote industrial symbiosis in their regions and the research groups works with them in projects. The workshop workbook did not require changes after testing. Both tools are included to the Purse and introduced in chapter 5.

The interviews with the research group and individuals were also important in more than just gaining information about the tools. It was valuable for the

research group members to recall all the tools that have been developed. To see all the tools and methods gathered in one place made the research group members proud of past projects. At the same time, it gave information for the author about the usage of the tools.

4.3.1 Developing the *SDG evaluation process*

The SDG evaluation process was developed in the *REDUCES*-project for the evaluation of good practices studied in the project. The international project funded by European Union is introduced more closely in the tool chapter 5.2.2. The *REDUCES*-project collected and evaluated good practices from different circular economy business models from their project's regions in Finland, United Kingdom, Spain, The Netherlands, Romania and Bulgaria. The aim was to assess circular economy business cases from their environmental impact, replicability and upscaling potential from these regions. The assessment framework was structured around the UN's sustainable development goals.

The SDG evaluation process had been used only in the *REDUCES*-project framework to evaluate the SDG impact of the good practices the companies have in project regions. The research group had set a target, that SDGs were about to include in the strategy. Suggestion to use planned evaluation process came in the second group interview in May 2022. The tool was not exactly published at all, only the method of using it and the results gained in the project.

The process of evaluating the SDG impact in the project was complicated, and for examining it for the thesis, it required three interviews with two of the developers, and desk work with the project cases to clarify the usability of the tool in other needs. The research work including interviews for the process was done in May to June 2022. The *SDG evaluating process* was developed further together with the research group's own SDG impact process, which is planned to be rerevised to a tool, that may serve better also the research group's needs in the future.

The templates that were used in the *REDUCES*, were *a good practice template* modified from the template given by the funder (Interreg Europe, 2014), *a questionnaire* the project's facilitators used as base for interview to get answers to *the good practice template* from the companies doing the good practices, and *an Excel sheet*, where the SDGs and their indicators were gathered. The Excel sheet is introduced later in the tools chapter 5.2.2. The research of the relevance of the circular economy practices to SDGs by Schroeder et al. was used to choose the SDGs for each business model. That is introduced in the theory chapter 3.2.

The SDG evaluation process was developed with *REDUCES* designed bodies for different tasks. First the most relevant SDGs were chosen to indicate different circular economy business models, for example product as a service. This work was done with *REDUCES*-project's evaluation coordination team and the chosen SDGs were marked to an excel template. The cases were introduced by the local project worker using *a good practice template*. The local project worker used a simplified questionary for interview the case companies to get the relevant information for *the good practice template*.

After local filling of the template, the good practice templates went to peer review to another project partner from different region. The impact of each case and the three aspects of potentiality were evaluated on a score high-medium-low. The filled template was given for review to the company, organization or project that had used the good practice. Finally, the evaluation coordination team went through all the good practice cases to evaluate the real impact. The framework does not evaluate if the good practice case had a negative impact, or follow the progress in the future, because they could not get enough information for that.

The good practices from different regions were published in a form of a study report with other same circular economy business model cases over different countries. A cover of the first four study reports is the picture 8. The reports were made from good practice cases on product life extension, product as a service and renewability, sharing platforms and resource efficiency and recycling (REDUCES, 2023).

Picture 8. Covers of REDUCES Study reports (REDUCES, 2023).

To use the *SDG evaluation process* in other purposes, the process needed to be re-thought. From the templates used in the *REDUCES*-project the author of this thesis formed new templates to use. The process used in the *REDUCES*-project was both too wide and too narrow. Too wide in the sense, that the project facilitator made the questionary to form the SDG indicators and the evaluation was made by other facilitators. And too narrow in the sense, that it did not follow the progress or evaluate how the goals were reached.

The author formed a template in PowerPoint to introduce the SDGs and help selecting the right ones to suit the user's needs. Another template was an Excel sheet for following the indicators. That was similar with the Excel sheet used in *REDUCES*. Both developed tools are introduced in the tool chapter 5.2.2.

4.3.2 Developing an *Industrial symbiosis workshop organizer's workbook*

Helping companies to form industrial symbiosis has been on a work list of the research group since 2015. Industrial symbiosis is a process, where waste streams and by-products of an industrial process become raw materials or resources for another process. Industrial symbioses are seen as a significant enabler for circular economy solutions and decreasing waste streams (TEM, Ministry of Economic Affairs and Employment, 2020).

Systematic development work for enabling industrial symbiosis was done in *FISS -Finnish Industrial Symbiosis System* -project led by Motiva and Sitra. The *FISS*

work was launched to Varsinais-Suomi area in *FISS Varsinais-Suomi* -project in 01.09.2015 - 31.12.2016, led by the research group. Following bigger development for industrial symbiosis work was done in *Circwaste*-project in years 2019-2023.

During the *Circwaste*-project the state-owned sustainable development company Motiva started to develop national waste stream platform called *Materiaalitori* (material market in English) in 2019. The goal of the *Materiaalitori* is to accelerate circular economy and promote the use of recycled materials. The *Materiaalitori* is intended for the professional exchange of waste and side streams from companies and organizations. (Motiva, 2021) The research group was testing the platform in spring 2019. In the beginning of 2021 Motiva asked help to implement the use of *Materiaalitori* to companies' everyday practices.

The regional coordinators of industrial symbiosis who are designated bodies that promote industrial symbiosis in their regions have been in key role promoting industrial symbiosis and their role was seen important in the implementation as well. The experience was, that they work alone in the region and the most important task would be supporting them. The research group developed a workbook that guides how to arrange an industrial symbiosis workshop.

Work started in 2021 by designing a workshop method based on the findings from the *FISS*-project. The developers from Motiva were working together with the research group to design a two-staged workshop, where the first one concentrated on introducing the *Materiaalitori* and the other one on how to form an industrial symbiosis from the first workshop's findings. The first workshop is for companies, who have not been use *Materiaalitori* before. The second one is for companies whose resources have been recognized interesting for some industrial symbiosis.

The development work was presented to national network of regional coordinators to test the idea of two-staged workshop in November 2021. Then four workshops in four regions were arranged to test the workshop method in action during winter 2022. The learnings from the workshop processes were

gathered to a form of a guidebook. The book was introduced to regional coordinators and tested again with three regions in the autumn 2022 with the help of facilitators from the research group. The workbook was modified based on the feedback from the users. The final *Industrial symbiosis workshop organizer's workbook* is introduced in chapter 5.3.1.

4.4 Implementation and dissemination

Since the beginning the main idea was to publish the templates and method descriptions under Creative Commons license at the research group's webpage. When the thesis process begun at late 2021, the author thought that all the tools and methods would be published both in Finnish and in English and with same format or visual outlook. That idea has changed on the way.

In March 2023 was held an implementation and publication workshop with two members of the research group. The webpage is already existing under the research group's *Kiertotalous2.0*-homepage (Kiertotalous 2.0, 2023), and the biggest question was where in the homepages the Purse will be published and how it will show up in there. One of the biggest changes made to the original plan was, that the tools would be published first only in Finnish. Only those tools that already have an English translation, will be available in English.

The place for the Purse is already built up to the Finnish webpages, as can been seen in picture 9, under the *Työkaluja*-title (*Tools* in English) in the header. The functions of the titles vary with different titles. Most of them open a submenu, where the subtitles guide the reader further. It was decided in the meeting, that the *Työkaluja*-title would guide straight to the Purse-page and the subtitles would

be there as click-on titles, which guide the reader on that specific place on the page where the tool is introduced. The introduction to the tool will then lead via link to the tool itself, the project's page or publication library, where the original publication is.

Picture 9. View to Kiertotalous 2.0 Finnish webpage (Kiertotalous 2.0, 2023).

Publishing happened in the summer 2023. From each tool, there is a short introduction to the tool, what is it and to what purpose. That is followed by a reference to the project where it was developed and when, and who can use it and how. The content has similarities with the way the tools are introduced in this thesis, but it is shorter on the webpage.

One problem that showed up during the process was, that the developed tools and methods have been forgotten, when new projects start. Another problem was, that the members of the research group may remember the tool or method, but not anymore in which project it was developed, so it is hard to find it after few years. Third problem that was recognized during the process was, that even the research group has developed many tools, the evidence is scattered around different online environments and it has not been possible to see all of the tools at once.

The Purse will be an answer to all these problems, but it seems it can be even more. When the publication of the Purse is closer, two members of the research group have been thinking the concept of the Purse more closely. Together with the author they have ideated how the Purse could be used in the future. Future plans are presented in the conclusive chapter 7.

4.5 Implication part
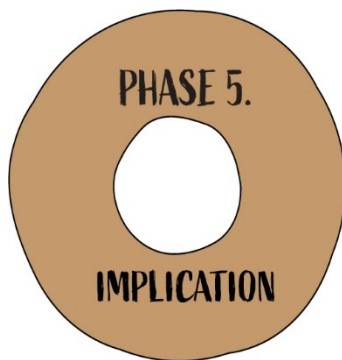
Conclusions, recommendations, and implications were done last, after everything that was going to be in the thesis, was in. When all the tools were described to the thesis and everything started to be ready, started the evaluating and confirmation round. The author made four short check-up interviews in April 2023 with those who have been developing the tools and methods, or leading the projects where they were developed. The confirmation was done in five different individual meetings, and the parts that were going to be examined were agreed beforehand. The idea was to concentrate on the correct description of the projects, tools and publishing of each tool.

The interviews clarified the tools, and some misunderstandings of the author were corrected. For example, the process of the *Research publication survey* was revised after interview because of the misunderstandings. The confirmation round also gave some ideas of how to use the tools more efficiently in the future. They are presented in the conclusions chapter 7.

5 Content of The Purse

This chapter is introducing the tools and methods. They follow the design thinking process chart as mentioned in the introduction chapter 2. Pieces of the doughnut are guiding the reader through the Purse. Starting point is in the understanding phase. Noticeable here is, that different the tools are rarely used with the same company or even in the same project. Usually, the project is using the same tool with several participants during the project, or only one tool is chosen to be used.

Noticeable with using many tools and templates is, that along with helping to gather information, ideate and define the aspects that are on the work, they also create a documentation of the development as themselves. Tools can help concentrating to the problem, but they can also be revisited later to see what has been planned or understood.
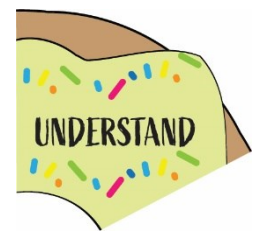
5.1 Templates for understanding

Tools for understanding are aiming to help the companies to clarify the starting points to their more sustainable future. They are tools to use in the very beginning of the process. The tools are published within the *CarbonWise*-project's webpage (CarbonWise, 2021).

CarbonWise-project was operating 1.4.2020-31.12.2021. It was funded by *European Regional Development Fund* and operating on national sphere. *CarbonWise* promoted awareness about company's own carbon footprint, how to decrease it and how to utilize carbon wise strategy to create competitive advantage considering the opportunities of circular economy and guided how to communicate the results.

CarbonWise-project produced a carbon wise path for companies to reach carbon neutrality. The path is presented in the picture 10 and the content of the path is listed below. The steps are visualized to the picture. In the webpage, the steps

are interactive, and the user can reach them by clicking the number. The materials and examples of the path are on the webpage available only in Finnish. The templates along the path are highlighted with bold text. Other steps do not include tools to use, they offer lectures, reading material and benchmark videos. The tools are introduced later in this chapter. (TUAS, 2021)

The carbon neutral path consists of:

1. Goals and calculators step explains how to state the goals and what kind of carbon calculators exist. This step provides easy to use **template to understand the carbon footprint** starting point of the company.
2. Effectiveness and procurements step on the path gives examples from the companies.
3. Circular business models are introduced on the next step. This step also provides a **template for understanding the circular economy** starting point of the company.
4. Experiments and demonstrations step opens up the need and value of experimenting new ideas fast and with low effort.
5. Compensation is the last option to reach the carbon neutrality. The principles and options for compensation is presented on this step.
6. Branding and communication are the last step on the path. This step gives both instructions and examples of how to communicate the change.
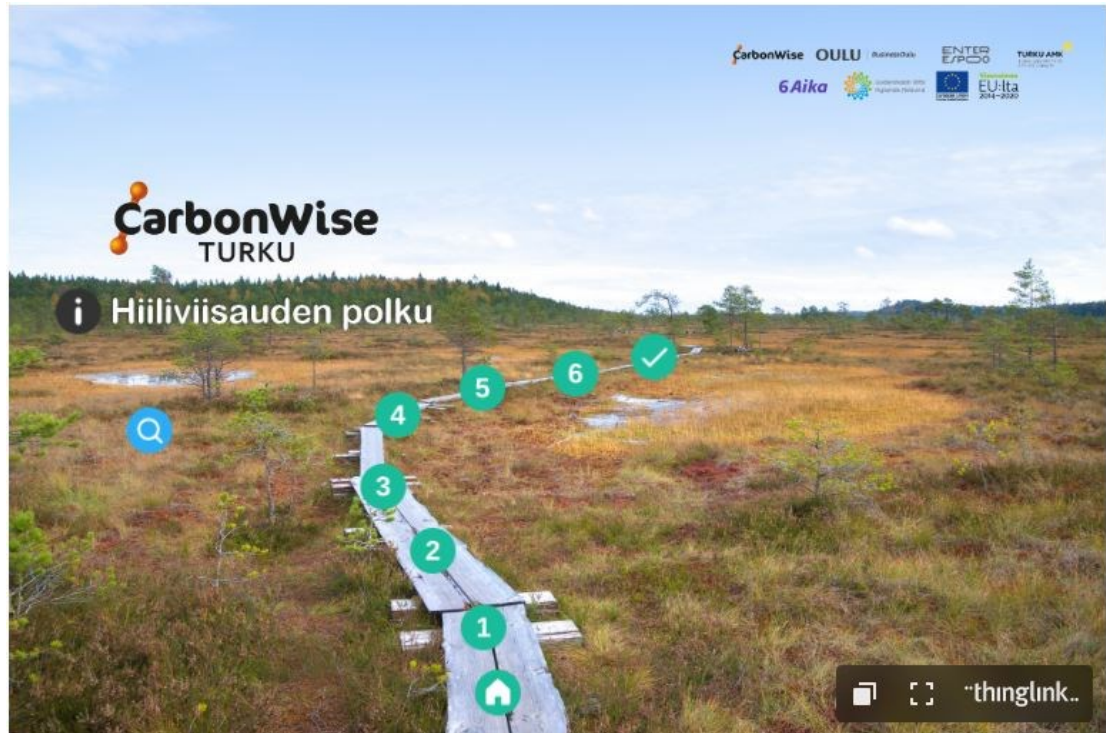
Picture 10. The CarbonWise path (CarbonWise, 2021).

The idea of a developing path to co-work with companies is used widely in the research group's projects. Other idea of a path was conducted in *Telaketju 2* - project, where companies of circular economy of textiles were increasing their knowledge about sustainable branding and communicating. The path consisted of workshops, lectures and assignments companies made on their own time on six months period in 2020.
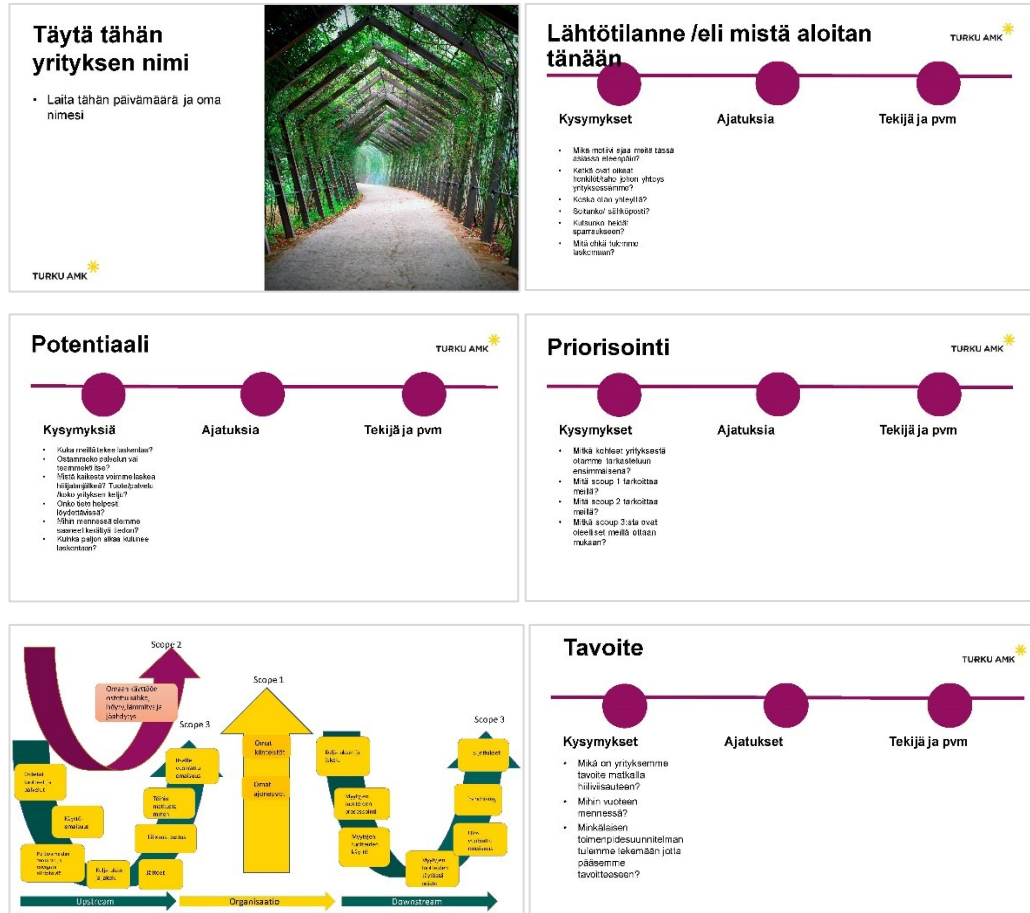
5.1.1 Understanding the carbon footprint

The template to *Understanding the carbon footprint* was created for the need, where companies have no idea what their carbon footprint is and how they could calculate it. The template was created by the research group members, and it was based in the Life Cycle Analysis (LCA) process knowledge of the research group.

Life cycle analysis is a method that is used to calculate and evaluate the environmental impact of selected product or service through its lice cycle. All the materials and resources are taken into calculation from raw materials to processing, selling, usage phase, recycling and disposal (Ilgin & Gupta, 2010). The LCA analysis for the companies is usually divided to three scopes of greenhouse gas usage called GHG Protocol, where the scope one emissions are coming directly from the company and its activities like facilities and vehicles, scope two emissions from the resource use of the company such as electricity and heat and scope three emissions from the upstream or downstream of the company, such as subcontractors and travelling (GCI, Global Climate Initiatves, 2023).

The template has been used specifically to start the journey together with the company. Facilitator from the project *CarbonWise* went through the questions in the tool to deepen the company's understanding about their starting point. The work itself needs to be done in the company and the template can be used by company alone.

The tool was tested with companies during the project. By thinking the template through companies could make the decision about the next actions they can start to reduce their carbon footprint. The template consists of planning four aspects to start and guiding questions for them. The overlook to template is presented in the picture 11. The first topic is a starting point and where to start today. Questions guiding to think about this are for example what the motivation of the company is and what would be the first thing to calculate. The second topic is potentiality and questions guiding there are for example who is going to do the calculation, can the person be found inside the company, or is there a need to buy it as a service. Other factor in this topic is the time frame. The third topic is prioritizing, and which scopes are to be calculated. The fourth topic is the goal, and the guiding questions are for example "what the target year for carbon neutrality is and the roadmap to get there".

Picture 11. The template for *Understanding the carbon footprint* (CarbonWise, 2021)*.*

5.1.2 Understanding the circular economy possibilities

The template for *Understanding the circular economy possibilities* was used also in *CarbonWise* and it is published at *CarbonWise*'s carbon neutral path. It was created first in a business education project called *Kiertotaloudesta liiketoimintaa -koulutus yrityksille (Circular economy to business - education for companies).* The project was running 16.6.2020 - 31.12.2020 and it was funded by the Finnish innovation fund Sitra. The project was an answer to the difficult situation for many companies in summer 2020, when the pandemic weakened their business possibilities. The research group held three-month course for eight chosen companies from the area of built environment, technology, process and engineering industries. (TUAS, 2020)

The template aligns with Sitra's first *Circular Economy Playbook*, where the circular economy business models and their sub-models are instructed to explore in picture 12 (Sitra, 2018, p. 26). The tool introduces the five circular economy business models and asks questions about the state of them, possibilities to use them and could this model be the right one on the path to carbon neutrality. It provides information about the business models but also supports to think the actions.

Picture 12. Inspiration for the template (Sitra, 2018, p. 26.).

The tool was tested first with eight companies participating the circular economy education and then with the companies involved in *CarbonWise* project. The tool can be used by company alone, but it helps if the facilitator can start the process with the company and analyse the result together with the company.

The tool introduces the circular business model and its sub-models. Then it guides to think all the sub-models through three questions. In the picture 13 one of the business models, renewability, is shown. All five business models are similarly in the template.

1. What is the current state in the company?

2. What are the opportunities of this business model to effect on the pain points, losses, or inefficient processes?

3. Could this business model be taken in use and help the company towards carbon neutrality?

Picture 13. Example from the template *Understanding the circular economy possibilities* (CarbonWise, 2021)*.*

Both templates *Understanding the carbon footprint* and *Understanding the circular economy possibilities* can be modified for example to a survey. They are published only in Finnish.

5.2 Methods for defining

Defining is one of the most important parts of the process. Tools that are created for this, are same tools that are then after the project used for validating the results and impact. They can be used in a single project, which is aiming to a big impact or in a strategic level for a company of organization.

5.2.1 Strategy for interaction and impact

In defining phase of the process, it is important to set up the targets and choose the metrics. *Circular Economy Catalysts: From Innovation to Business Ecosystems* -project, shortly *CICAT2025*-project, has formed a template that helps to define the projects impact, interaction and communication. *CICAT2025* was a joint project of Finnish universities, nationally operating during 1.11.2018-31.12.2023. It was a research project funded by Academy of Finland's strategic

research council. The project supported Finland's strategic objective to become a global leader in circular economy by 2025 by exploring a wide range of circular economy catalysts that have the potential to accelerate the adoption of circular economy principles in society and in business. (TUAS, 2020)

The funder of the *CICAT2025*-project was asking a strategy of interaction from the funded projects. They did not offer any template or instructions for the strategy like that. The research group was the leader of interaction in *CICAT2025*-project and took the opportunity to form a new kind of instructions for impact, interaction and communication.

The strategy for interaction and impact starts from the idea, that the project that is using the template, is aiming for a change in society or even in wider perspective. To fulfil the change, interaction is needed, because change happens in interconnections between people and organizations. There comes the idea of an interaction strategy. The interaction strategy is on its best when it is done at the beginning of the project, or already in the preparation phase.

The template is following the strategy process closely and giving instructions to what should be clarified in the strategy. The filling starts from the impact goals. It guides to think what is the change that the project is aiming to. The goals are turned then to indicators, which are in SMART-form. The letters come from S - specific, M - measurable, A - attainable, R - relevant and T - time-bound. The template guides how to follow the indicators to measure the wanted change.

The template guides to form the core messages from the just formed visions and impacts. It asks who are the right stakeholders and channels that are needed to get the messages out and what is the right timing for each message. It also gives examples of how to implement the impacts in real life. The idea is to supplement and improve the strategy during the project, because the means and the aims may change, especially in long projects.

The topics of *the Strategy for interaction and impact* are:

1. Impact goals
2. Change vision table and SMART question chart are introduced more closely in the table 3.
3. Monitoring the effectiveness of interaction
4. General core messages of the project
5. Stakeholders in interaction
6. Interaction channels
7. Interaction activities
8. Interaction stories

Table 3. Change vision table from *The Strategy for interaction and impact* (Inka Mäkiö, 2023).

Change / vision	Targeted impact	Impact goals
Write here what is the change wanted.	Define the concreate effect of the change by answering the questions.	Use the questions from targeted impact to form SMART impact goals.

The questions used for defining the targeted impact are:

- What does it have to change?
- Who is involved in this?
- What's the starting point?
- What is the desired end?
- By what time has the desired outcome been reached?
- How do we know this has changed?
- Where and how do we monitor the achievement of the goal?

The template is supposed to use in the beginning of the process, and it is necessary to familiarize the strategy to all the partners of the project. It is even more efficient if they can participate in filling the template. It is meant to use in projects, where the interaction is strongly leaded by one of the partners. The template can be used only partly, if for example it is necessary to identify the

common goals of the partners, as it was done when the author of this thesis was testing the tool in other projects. Or if the impact part seems to be too heavy for some project, the rest of the template can be use to plan the communication effectively.

The strategy for interaction and impact -template is published at the *CICAT2025* webpage as it shows in the picture 14. The template is introduced shortly in the text and CC-licensing is mentioned in the intro text. *The strategy for interaction and impact* is used by other projects funded by Academy of Finland's strategic research council. *The strategy for interaction and impact* is tested with other projects and one example was introduced in chapter 4.3.

Picture 14. A screen shot from the *CICAT2025* webpage (CICAT2025, 2023).

5.2.2 SDG evaluation process

SDG evaluation process was developed in a *REDUCES*-project for the evaluation of good practices studied in the project. *REDUCES - Rethinking sustainable development in European regions by using circular economy business models* was an international Interreg Europe funded project, where the main aim was to improve the implementation for regional policies. *REDUCES* was running 1.8.2019-31.7.2023 and project partners represented six European countries and

their regions. The aim was to evaluate were the circular economy practices actually more sustainable, and what their overall impact was. (TUAS, 2022)

The process used in *REDUCES*-project is introduced in chapter 4.3.1. The author redesigned the process to suit better for the research group's needs to implement the SDGs to their strategy. The *SDG evaluation process* includes a PowerPoint template to introduce the SDGs and help choosing the right ones and an Excel sheet for following the indicators. The Excel-template in *SDG evaluation process* is very similar with the Excel sheet used in *REDUCES*.

The template includes a short introduce to Finland's sustainable development goals, which are introduced in the theory chapter 3.3, and instructions of how to use the template. At the end is a table to help to form the indicators. The process starts with going through the SDGs one by one and discussing their suitability for the strategy, project, or course's needs. All the SDGs are introduced with their sub-targets. The selected SDGs and the sub-targets are marked to the template, for example as it is in picture 15.

Picture 15. A Picture from the *SDG evaluation process* template (Inka Mäkiö, 2023).

After the targets are set, an indicator for each target is to be chosen. The template does not include the indicators, but the user is guided to visit the UN webpage to find indicators to use (United Nations, 2023). It is possible to use also other

indicators that the user finds important and measurable. They can be formed for example from internal indicators. The selected indicators are marked to the indicator table, introduced in the picture 16. The table needs to be copied after each selected SDG.

Picture 16. SDG indicators slide from the *SDG evaluation process* template (Inka Mäkiö, 2023).

The selected indicators are then marked to the follow-up Excel sheet. The evaluation about the SDG's suitability for circular economy on the first sheet in the Excel. It aligns Schroeder's article about the relevance of circular economy practices to the SDGs. Schroeder has studied the relationships between circular economy practices and SDG's (Schroeder et al, 2019). The Excel sheet includes the SDGs with the sub-targets in English and Finnish, examples of indicators that could be used, space to mark down the measurement unit and information about the case or project, and a yearly follow-up. The overview is seen in the picture 17.

	A	B	C	D	E	F	G	H	I	J	K
1			SDG 7 Ensure access to affordable, reliable, sustainable and modern energy for all								
2		target		in Finnish		indicator	unit	case /project n business model type		2022	2023
3	filter		SDG targets (at macro-economic level)								
4	SDG	7.1	By 2030, ensure universal access to affordable, reliable and modern energy services	Varmistaa vuoteen 2030 mennessä edulliset, luotettavat ja uudenaikaiset	7.1.1	Proportion of population with access to electricity					
5	SDG				7.1.2	Proportion of population with primary reliance on clean fuels					
6	SDG	7.2	By 2030, increase substantially the share of renewable energy in the global energy mix	uusiutuvan energian osuutta merkittävästi maailmanlaajuisessa energialähteiden yhdistelmässä.	7.2.1	Renewable energy share in the total final energy consumption					
7	SDG	7.3	By 2030, double the global rate of improvement in energy efficiency	Tuplata vuoteen 2030 mennessä energiatehokkuuden	7.3.1	Energy intensity measured in terms of primary energy and GDP					
8	SDG	7.a	By 2030, enhance international cooperation to facilitate access to clean energy research and technology, including renewable energy, energy efficiency and advanced and cleaner fossil-fuel technology, and promote investment in energy infrastructure and clean energy technology	Tehostaa vuoteen 2030 mennessä kansainvälistä yhteistyötä, joka tarjoaa mahdollisuuksia puhtaan energian tutkimukseen ja teknologiaan, uusiutuvan energian käyttö, energiatehokkuus ja edistynyt sekä	7.a.1	International financial flows to developing countries in support of clean energy research and development and renewable energy production, including in hybrid systems					
			By 2030, expand infrastructure and upgrade technology for supplying modern and sustainable energy services for all in developing countries, in particular least developed countries, small island	Laajentaa vuoteen 2030 mennessä infrastruktuuria ja uudistaa teknologioita uudenaikaisten ja kestävien energianalveluien		Investments in energy efficiency as a proportion of GDP and the amount of foreign direct investment in financial transfer					

SDG's | Scoring | TUAS_example | SDG 1 | SDG 2 | SDG 3 | SDG 4 | SDG 5 | SDG 6 | **SDG 7** | SDG 8 | SDG 9 | SDG 10 | SI ...

Picture 17. An overview to *SDG evaluation process* Excel sheet (Inka Mäkiö, 2023).

5.3 Tools for research

Research is mostly done with commonly used research methods as everywhere else. In the research group's work, the students have an active role in research, and it is done in various ways. Some research can be part of a course work or thesis, it can form a separate research project depending on the topic. The first method presented here is a workshop organizer's guide produced to thrive industrial symbiosis. The other tool is connected to documentation and research publication.

5.3.1 Industrial symbiosis workshop organizer's workbook

The development work for the *Workshop organizer's workbook* is presented in chapter 4.3.2. The workbook was created in *Circwaste*-project. The *Circwaste* was running during 1.10.2016 - 31.12.2023 and was funded by EU Life IP program. The project was coordinated by Finnish Environmental Institute SYKE, and the research group was working as a part of a circular economy service centre for municipalities. (TUAS, 2023)

The workbook provides hand-in-hand guiding on how to arrange an online workshop for companies about introducing *Materiaalitori* and the idea of industrial symbiosis. The workbook's structure is following a timetable for preparing the

workshop. The timetable starts two months before the actual workshop and the workbook guides what to do in each week when preparing the event. The workbook consists of several templates to use during the preparations. The templates are published in revisable form.

Templates in the *Workshop organizer's workbook* (Mäkiö & Jaakola, 2023)*:*

1. Invitation letter for the companies
2. Advertisement to the organizer's webpage
3. Registration form
4. Preliminary instructions for the workshop attendee
5. Preliminary material: Resource chart
6. Preliminary material: Instructions for signing into *Materiaalitori*
7. Frame for invitation calls
8. Actor form to fill in information during the introduction round in the workshop
9. Instruction materials about *Materiaalitori* for the workshop
10. Follow-up letter

The workshop for industrial symbiosis always needs the key facilitator, who invites the participants and holds the presentations. *Materiaalitori*-platform itself can be used without a workshop, but the event encourages companies to take it in to use. The workbook is available only in Finnish. The cover of the workbook is presented in the picture 18.

Picture 18. The cover page of the *Workshop organizer's workbook* (Mäkiö & Jaakola, 2023).

5.3.2 Research publication survey

The research publication survey was developed in *CICAT2025*-project. As mentioned before in chapter 5.2.1, *CICAT2025* was a research project dedicated to make research about circular economy catalysts. One of the key features in the project was publishing new knowledge so that public has easy access to it and that is understandable to masses.

Research publication survey is built with survey application Webropol. With the help of the survey, it is easier to form the introduction to the project webpage and to social media. The researchers have the best knowledge about the research, and through the survey they can easily formulate easy access information about the research. In *CICAT2025*, the project's communication team goes through all the survey answers and makes the publications.

The survey asks 17 questions:

1. The name of the research
2. Writers and their research organizations
3. The format of the publication (an article, a chapter in a book, conference presentation, master's thesis etc.)
4. Publishing platform and the permanent link
5. Connection to the project's work packages
6. Research document attached
7. Abstract of the research in Finnish and a) what was studied, b) main findings, c) connections to the project
8. Abstract in English
9. Compact summary about the results
10. Hashtags for social media
11. What chosen project's stakeholders can benefit from the results
12. How project's stakeholders can benefit from the results. This is asked to do via concreate examples.
13. Other ways to use the results (I the project or elsewhere)
14. Comments or wishes for communication team

15. Contact person and their email for more information
16. Which project indicators the results impact
17. Introduction text about the research to social media (max 200 marks)

First six questions are about the background of the research publication. Connectedness to the project is asked in questions number 5, 11, 12, 13 and 16. These questions are related to the project's work packages, stakeholders and impact. The name of the publication (first question), the authors (question 2), permanent link to the publishing platform (question 4), the summary (question 9), potential beneficiaries of the results (question 11) and the contact person (question 15) are announced at the webpage. The view to the results page is presented in the picture 19. Hashtags (question 10) and introduction text (question 17) are specially used to make social media posts about the research results. The example usage of them is shown in the picture 20.
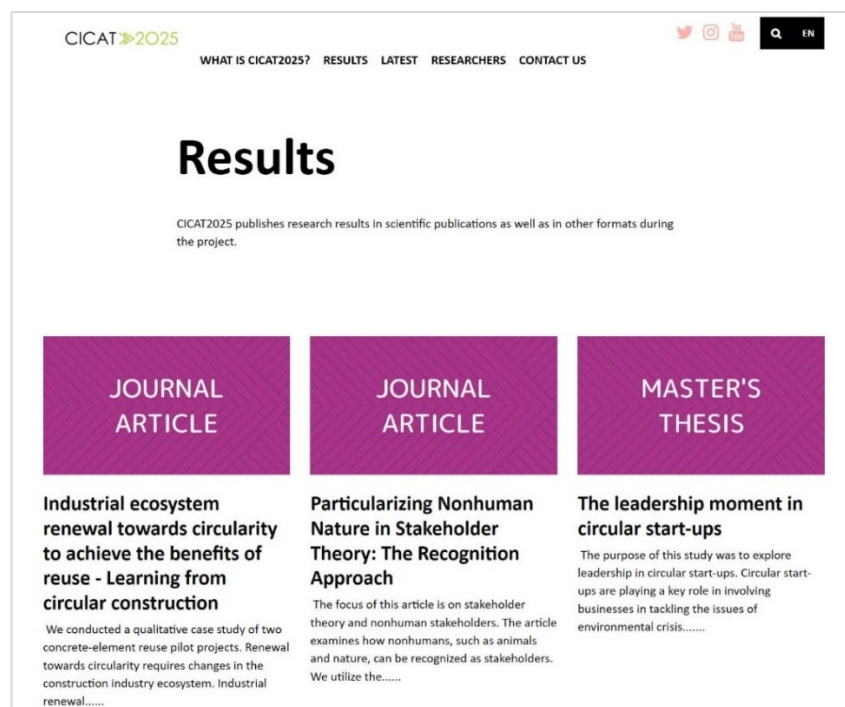
Picture 19. View to the *CICAT2025* results page (CICAT2025, 2023).
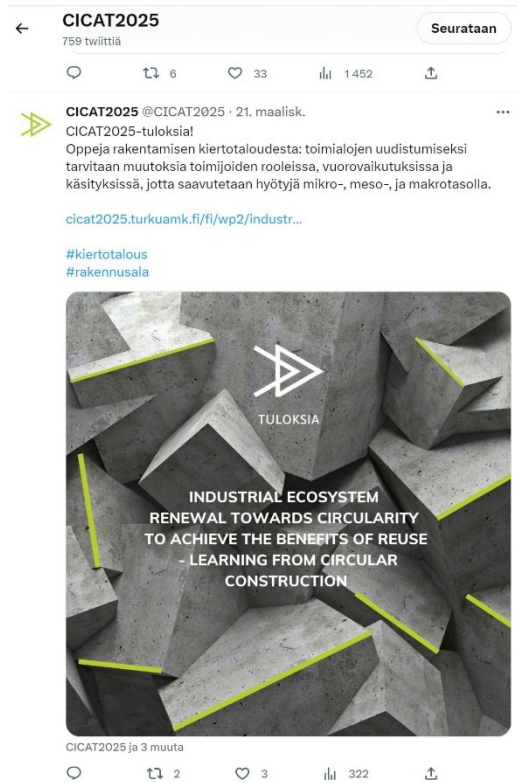
Picture 20. An example from social media post about the research in Twitter (CICAT2025, 2023).

The survey is available only in Finnish and it is highly connected to publishing the research results. It can be used by a researcher alone to gather the information about own research, or it can be used by research project's communication and interaction team to collect all the results from the project. The research publication survey helps also to gather needed information for the funder of the project. By changing the hashtags, stakeholders and indicators, the survey is easily modified to other project's needs.

5.4 Methods for ideating

The joy of working with students is, that the possibility to get fresh ideas is always present. Ideating methods presented here are workshops, which are developed to use with students. They have some similarities, but they are developed in different projects.
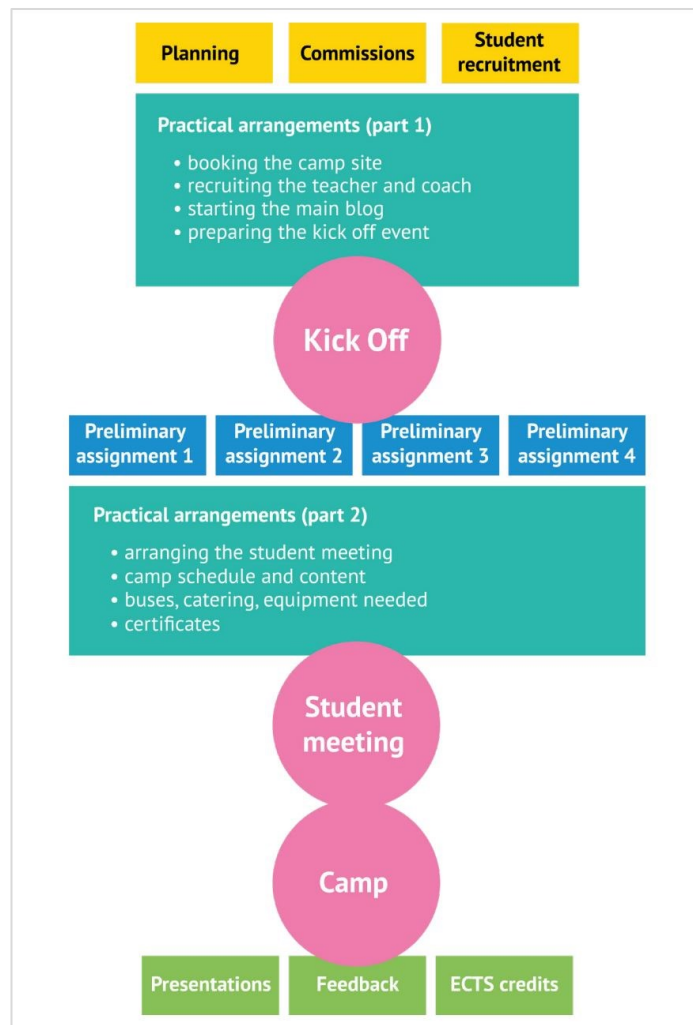
5.4.1 Innovation camp manual

The Innovation camp manual was produced as a part of the *Resurssivirrat haltuun* -project, a joint project of Turku University of Applied Sciences, City of Lahti and JAMK University of Applied Sciences. The project was funded by the Finnish Innovation Fund Sitra. The project was running 1.10.2013-31.12.2014. (Malve-Ahlroth et al. 2019.)

The innovation camp is a way to bring students and companies together to solve real life challenges for the companies. Students get a change to develop their skills, contribute to innovation processes and meet company representatives. Companies get fresh ideas, and they get to know the possible future employees. The manual contains checklists and tasks that needs to be done for setting up the camp, as well as templates and additional materials that are helpful in the process. Innovation camp can be one study module for universities, and in the manual, it is described as InnoCamp, eight weeks long module, where students can get 3-5 study credits.

In the preface of the manual is said, that "a successful innovation camp is a joint effort by several interest groups: in addition to the coordinator, it takes active and motivated students, open-minded and unprejudiced commissioners, enthusiastic experts interested in promoting the development of their field, and skilful coaches who excel in innovation potential development." (Malve-Ahlroth et al, 2019)

Innovation camp manual guides organizing the camp from the beginning. The process is called a roadmap and it is visualized in the picture 21 from the manual. The roadmap is to be read from up to down. First the yellow boxes mark what are the starting points of the camp. There are the planning, commissions and student requirement. They are followed by practical arrangements such as booking the camp site and starting the main blog. The camp starts with a kick-off event, where the preliminary assignments are given to the students. Kick-off is followed by second part of practical arrangements, such as camp schedule and content, buses, catering and equipment needed on the camp. The students meet before

the camp for preparing, then is the camp itself. The camp is followed by presentations, feedback and credits.

Picture 21. Roadmap of Innovation camp (Malve-Ahlroth et al, 2019).

The sustainability aspect is added of course in camp practicalities (how to arrive, what to eat) but the biggest impact comes from the assignments the companies give to students. The manual also introduces common innovation and ideation methods, such as *Brainstorming* and *SWOT* (Malve-Ahlroth et al. 2019, pp. 27-30.). The manual can be used by other parties, who want to arrange an innovation camp. It is available both in Finnish and in English.

5.4.2 Methods for Circular Economy Teaching

The idea of innovation camps is joint with circular economy teaching in general. The method guide introduced next is developed in the project called *#circulareconomy – New Pedagogy and Corporate Cooperation to Promote Module Studies in Circular Economy*. The project was funded by the Finnish innovation fund Sitra, and it was running at 1.11.2017-31.12.2018. The whole name of the publication is *Methods for Circular Economy Teaching - Method Guide and Tool Kit*. It is published in the Turku university of applied sciences publications and both Finnish and English guides are available also as prints. (Kiertotalous 2.0, 2022)

This guide was done together with Tampere and LAB universities of applied sciences, and it was led by the research group. All three partners were using different project learning methods to teach circular economy. The methods introduced in the guide were tested with Savonia, Oulu and Vaasa universities of applied sciences.

The guide introduces the similarities of setting up a project learning instrument. The working phase from the guide is presented in the picture 22. It starts with students enrolling to the course, commissioner giving the brief and students building the team. That is followed by project plan, information search and innovation methods. Then the students prepare a progress report, prepare a presentation or report. Then comes the final report with presentation and the process ends with assessment and feedback.
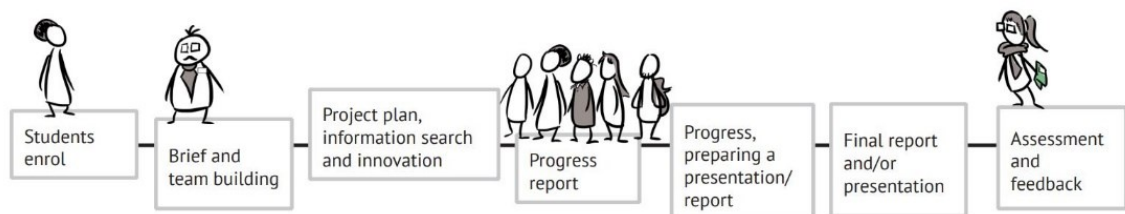
Picture 22. Working process of a project learning instruments (Mäkiö & Virta, 2019, p. 18.).

The brief given to the students is in core of the successful project. The guide states that "There is no circular economy project without a client who needs something worked out." The most important aspect of the brief a client gives is, that it meets a real need. Genuine cases from work life motivate the students taking part. The brief should concern circular economy, it should have an impact on society but, above all, it should have significance for the client. The link with real life is the important factor even if the solution would not be revolutionary." (Mäkiö & Virta, 2019, p. 13.)

The guide gives useful tips to prepare the project from advertising the project to the students, to preliminary preparations and above-mentioned sights to the client and the brief. The working phase is covering all the phases of the project studies from building the student teams, roles that are needed, following the student's work, and facing the challenges. There is one chapter about assessing the project and, in the end, all three project learning methods are introduced. The methods are *24 h Innovation camp, Circular Economy Path* and *Research Hatchery*. The last one is a method the research group has described to the publication.

As it says in the title, the guide consists of a tool kit. The tools and templates are mentioned in the text when they are used.

The tool kit consists of:

1. Checklist and examples of timings for a coach
2. Agreement on a commission
3. Guidelines for students
4. Monitoring the project
5. Draft for a project plan
6. Project log
7. Guidelines for the learning journal
8. Guidelines for the learning report
9. Guidelines for presentations
10. Innovation methods
11. Games for team building

12. Innovation competences
13. Joint assessment framework with emphasis on circular economy competences
14. Feedback on a study module
15. The client's evaluation
16. Evaluation of the presentation
17. Evaluating an idea

There are such tools as a template for agreements with the client, a draft for project plan, a learning diary, a feedback form and evaluation guides, and tools and games for innovating. The guide and the methods introduced in there can be used in many other ways as well. The principles for project learning are quite the same and specially the tools can be modified to suit the user's needs.

5.5 Templates for testing

Testing phase is important to experience the early failures and success factors. There are several methods for testing starting from roleplay and ending to several months' trials, but the one method the research group has used for various experiments is the *documentation of experiments* template.

5.5.1 Documentation of experiments

The *documentation of experiments* is a template developed in *TRY OUT!* -project. The *TRY OUT!* -project was introduced in the background chapter 1.2. The template was one of the key takeaways from the project. The template is for documenting learning outcomes and impacts of the experiments. It identifies seven steps that are important to document during the experiment to achieve the best learnings from the experiment. The documentation path is instructing the filling with suitable questions. The template is presented in the picture 23. The seven steps of documentation of experiments are:

1. Objective: What was the aim of the experiment?
2. Execution: How was the experiment implemented?
3. Cooperation: What kind of partners were involved?
4. Variables: What kind of variables were? What was measured?
5. Expectations: What kind of impacts were expected?
6. End results: Was the experiment successful? Did it bring new knowledge?
7. Conclusions: What was found out? Were the results reliable?
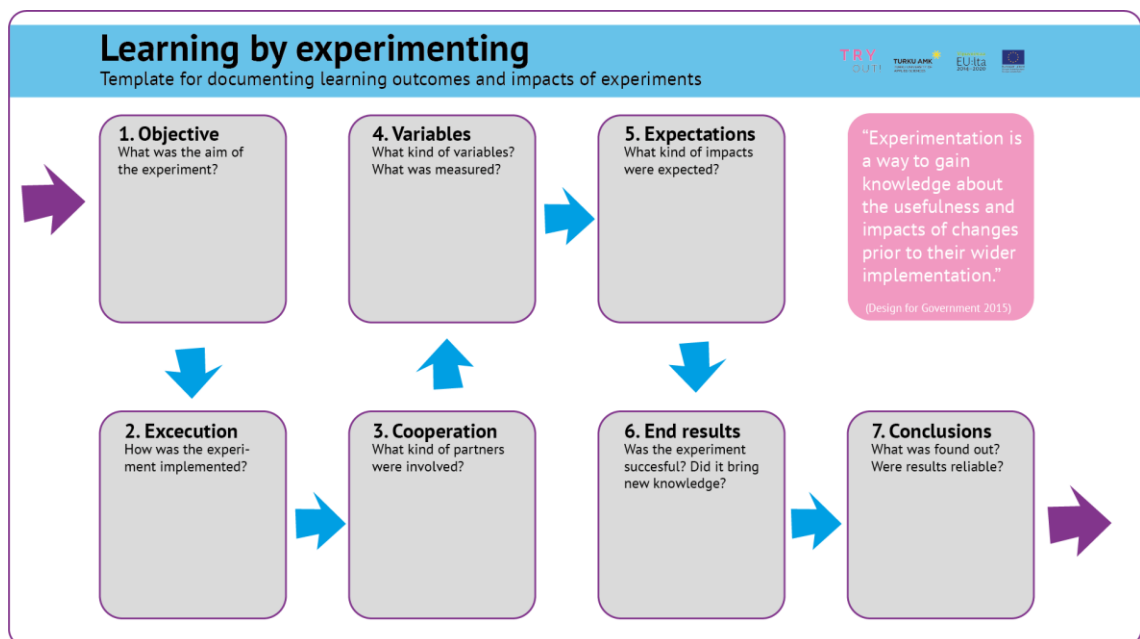
Picture 23. *Learning by experimenting* template from *TRY OUT!* project (TRYOUT!, 2019).

The *documentation of experiments* template has been used in many other projects afterwards. In the *CircHubs*-project the template was used disseminating the results. The experiments were published in the template on project's webpages. In the *Telaketju*-project the template was used not only documenting the experiments, but also other types of pilots and solutions.

The *documentation of experiments* template is filled by the project facilitator together with those who participate on experiments. The template can be use as it is formed, as a visualization, or it is possible to take only the titles and order and use them as structure of a report. The template can be used for experiments

that support green and just transition, but it can be used in many other experiments as well. The template does not guide automatically to take sustainability as key factor.

5.5.2 Guide for developing Product as a Service business

The Guide for developing Product as a Service business is actually more than just testing, but the core idea of the process is prototyping and piloting a chosen business model, so the method is introduced in this phase.

The guide was developed in a short project called *PaaS Pilots – Product as a Service pilots*, which was running at 27.9.2021-13.6.2022. The project goal was to pilot Product as a Service (PaaS) models and find out the factors make the model attractive to the customer and for the company. The PaaS model is one of the circular economy business models as presented in the theory chapter 3.2, where the product is owned by a company and a customer has various ways to use it. (TUAS, 2021)

The guide introduces first generally product as a service model and the value creation in it, economic, environmental and social aspects of the model and examples. Then comes a developer's path, where detailed instructions of the important features in each step of the path. The developer's path is visualized in the picture 24. The guide concentrates on prototyping and piloting the business model and the learnings from the testing phase help to develop the service further. The guide does not include specific tools or methods for developing different steps, but it introduces few toolboxes that contain service design tools to use. The two pilot cases are introduced in the latter part of the guide.
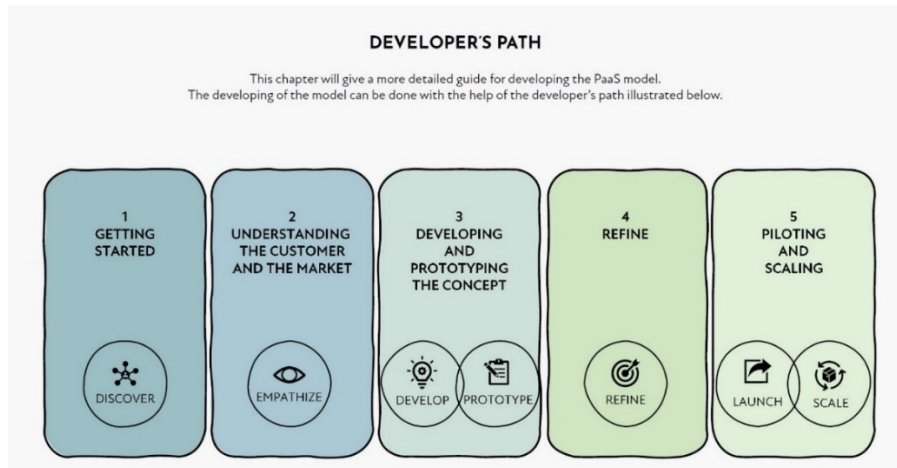
Picture 24. Developer's path from the *PaaS guide* (Heinonen, et al., 2022).

The guide introduces two pilots, where the developer's path methods were tested. The pilot companies were from textile industry, but the guide can be used companies in general. The method is usable both in business to consumer, and business to business markets.

The developer's path contains seven steps, which are:

1. Getting started
2. Understanding the customer and the market
3. Developing and prototyping the concept
4. Refine
5. Piloting and scaling

The Guide for developing Product as a Service business takes environmental aspects of the business model as one of the three value creation pillars along with economical and societal value creation. They are called the triple bottom line of sustainability and it is important for companies to understand both positive and negative impacts of their actions for all these three aspects. The guide can be used by a company alone, or it can provide a structure for facilitated process with the company. The guide is available both in Finnish and in English.

5.6 Tools for launching and implementation

Launching new information or materials, or implementing the research is one of the key factors in all processes. Interaction is one of the research group's strengths, and it takes often the role of a communicator in the projects. Templates or instructions to communication are made in several projects.

5.6.1 Communication plans

Communication plans are gathered from different projects, and they are developed by doing. The planning templates were published first in Turku UAS's intranet. Examples and instructions published in there are created by research group's communication experts. They provide templates of:

Communication plan and strategy in PowerPoint, which guides to think the goals, target groups, channels, actions and responsibilities of the project communication. It also requires forming the core messages of the project.

Social media strategy and instructions in PowerPoint, which guides to answer to why, to whom and where, what, when, who and how to follow-up the social media publications. It gives general instructions about posting in social media and more detailed instructions for the Facebook and Instagram, such as "do not use the name of the publication as a title of the post, you are the interpreter between the research and the public".

Content calendar in Excel gives an overview of a year and guides to plan publications from themes, articles, newsletters, events and partners perspectives. The template also includes an idea bank in one of the sheets, where the ideas can be gathered under the core themes of the project.

Social media calendar in Excel is structured over a weekly plan and the social media channels. The idea is to plan the content weekly and publish it in selected social media platforms.

Communication follow-up in Excel is listing the main publication channels to one Excel and labelling a sheet per channel. The social media channels, web pages, newsletters and articles are to be followed. The number of followers is filled to each social media channel. The attendance of the webpages is gathered as well as how many receive the newsletter, how many opens it and how many click some posts to read further. The article sheet is gathering the publication information about the blog posts, articles and news.

Communication plan for an event as Word document is for planning an event. The actions are guided to be scheduled as which action, the target group, the aim of the action, timing and responsible person.

Templates are meant to use in project communication both planning and implementing. The templates are meant to fill together with the project partners and they provide guidelines for communication throughout the whole project. The templates do not include any kind of sustainability aspects, they concentrate purely on the communication. The templates are available only in Finnish.

5.6.2 Social media instructions for collaborative network

Topinpuisto circular economy network was established in *CircHubs* project in the years 1.5.2017 - 30.9.2019. The project was funded by European Regional Development Fund. The regional actions were done together with the local waste management company Lounais-Suomen Jätehuolto Oy, who is the core player of the *Topinpuisto circular economy park*. The project aim was to develop regional circular economy parks, such as *Topinpuisto*, their collaboration, and support circular economy innovations at network. (TUAS, 2017)

The social media instructions for *Topinpuisto* network were done in the project to increase the main actor's impact. The instructions start from the notification, that personal impact in social media can be important establishing a new network and bringing up new innovations. Instructions highlight the personal expertise profile and goals in social media.

The social media instructions introduce eight plus steps to build effective impact and they are also visualized in the picture 25. The instructions are only in Finnish and text from the picture is translated here. The title is "impactful expertise and catchy enthusiasm". The text says: "Let us take together the impressive expertise and catchy enthusiasm! Everyone works in social media on their own personality and terms, but this guide is designed to encourage you, who wants to participate more strongly in joint communication as part of a group of circular economy professionals in the region. Bring out your expertise and strengthen the network – circular economy solutions develop together!" (CircHubs, 2019)

The steps to social media are:

1. My role in social media.
2. My own goals in social media.
3. My channels.
4. My social media profile.
5. Who to follow in different social media channels.
6. Participate in discussion.
7. Create own content.
8. Follow-up your goals.

Plus, tips for good social media posts.

Picture 25. Social media instructions for *Topinpuisto* network (CircHubs, 2019).

The social media instructions are meant for individuals, who work as experts in the field. They do instruct users to speak positively about circular economy and the network. Instructions can be used alone by one expert, or there can be a training session for the network, where the steps are taken together and for example the social media profiles are updated, or a new social media platform is studied. Learnings from the instructions have been used afterwards in *Telaketju* -projects and in *CICAT2025*-project, where the individual experts are in core of the social media dissemination.

5.6.3 Impact plan for policy brief

Impact plan for policy brief is developed in *CICAT2025*-project and the project itself is introduced in chapter 5.2.1. The need for impact planner for policy brief came from the notice, that even if the policy brief is done carefully, it is based in the research and it is easily understandable, it may not reach the decision makers

and politicians. A policy brief is a way of introducing the research results to the policy makers and the right timing is important so that the research can have an impact on decision making (Strategic Research, Academy of Finland, 2023).

Impact planning starts together with the writing process of a policy brief. The impact plan is built in form of a timetable, where the dates of progress and responsibilities are marked, starting from defining the goals for the policy brief. That is necessary for timing the whole publication process, because it may be important to schedule the brief with decision making processes.

The impact plan consists of three parts, where the first one is scheduling the writing and publication process, which can be seen in the table 4. The second one is aligned with the changes and indicators made in the *Strategy for interaction and impact* or the changes in the society the policy brief is aims to. The third one is for listing those people and organizations who are the target group for the policy brief and who and when the policy brief is introduced to them.

The impact plan is suggested to do together with the researchers writing the policy brief and the interaction and communication team. The template is available only in Finnish.

Table 4. Schedule for *Impact plan for policy brief* translated to English (Inka Mäkiö, 2023).

Phase	Action	Responsible person	Date
The writing phase	Definition of objectives		
	Identifying the timetable for decision-making processes		
	Stakeholder involvement in the process?		
The first draft	Taking advantage of the steering group's view		
	List of people and organisations in advance		
	Communication in social media?		
During the publication	Publication event		
	Online recommendation in Finnish and English		
	Media release and invitation		
	Webinar or short video collection out?		

	Listing on the policy recommendations portal		
	Social media campaign on releasing day		
After publication	Blog texts 1-4 of the background to the recommendation		
	Planned meetings to share the recommendation face-to-face		
	Follow-up of people and organisations		
	Follow-up on decision-making processes – will the recommendation be used?		

6 The Purse in use

The tools and methods collected into the Purse are developed to help companies and organizations to find new sustainable ways via circular economy business models. The tools can be used alone by a company, but the best result is gained with interaction and guidance. The user of the Purse is mostly project worker or facilitator of the development project. Service design is a method of co-creation and a service designer's mindset and knowledge are valuable factors in facilitating the processes. To clarify what kind of tools are in the Purse, they are divided by what kind of tool they are, what kind of interaction is needed and who are the key actors in the process. The division is presented in table 5.

Some of the tools are in form of a path, where usually the facilitator is guiding company towards the change. Those tools can be usually used as well by the company alone, but the experience has shown that facilitator helping the process is best for the results. Development path needs committed person from the company, who is responsible of the process. The facilitator is helping them to get forward. These paths are highlighted to the table 5 with green colour.

Some tools are in form of a guide. There the interaction may happen also between companies and students. When students are involved, there is always a teacher or a coach, who acts as a facilitator in the process. The students can be the ones to do the development work with help of the company, and the guide is especially for the one who is facilitating the process. The facilitator has a big role in these types of methods, except in the social media instructions, that are usable by individuals alone. The guide-type-tools are highlighted to the table 5 with blue colour.

Some tools are more like planning tools for longer time period. Usually, those tools are used by research partners, who can include companies if it is important for the goal of the project. The plans are done together, and the aim is also to implement and follow-up the realization with all research partners. These tools are highlighted to the table 5 with purple colour.

And finally, some of the tools are just templates to plan or follow-up different kind of acts in the process. These templates are usually instructed by someone who knows them, but they are meant to be used alone. The information that they are gathering is meant to use together, and these templates are clearing the communication. These tools are highlighted to the table 5 with orange colour.

Table 5. Tools and methods in use (Inka Mäkiö, 2023).

Process phase	Name of the tool	Type	Interaction between
Understand	Carbon footprint	path	Facilitator and company
Understand	Circular economy	path	Facilitator and company
Define	Strategy for interaction and impact	plan	Research partners
Define	SDG evaluation process	plan	Research partners
Research	Industrial symbiosis workshop organizer's workbook	guide	Facilitator and companies
Research	Research result documentation	template	Research partners
Ideate	Methods for Circular Economy Teaching	guide	Students and companies
Ideate	Innovation camp manual	guide	Students and companies
Test	Documentation of experiments	template	Facilitator and companies
Test	Guide for developing Product as a Service business	path	Facilitator and companies
Launch	Policy brief impact plan	plan	Research partners
Launch	Communication instructions	templates	Research partners and companies
Launch	Social media instructions	guide	Research partners

One crucial factor for publishing the Purse was, that the tools needed to be openly accessible and licenced to the research group. Another factor that came up at the implementation phase of the process was, that the tools needed to be use more also by the research group.

As education is the key element in universities of applied sciences, the research group started to ideate how the use of the Purse could be implemented to circular economy studies. The idea is just seeded to the minds of the research group, and after the Purse is published, development work for implementation will take place.

7 Conclusions and suggestions

The aim of this thesis was to gather, introduce and further develop all the tools and methods the Circular Business Models research group of Turku University of Applied Sciences is using to help organizations to shift towards more sustainable actions. The tools and methods gathered here are published as a toolset called the Purse. The tools were produced and tested in various projects in the years 2016-2023. From the Purse, the tools are open access published for project facilitators to use in development projects with companies and other organisations. The aim of the Purse is to offer tools for boosting circular economy. The main idea in circular economy is to decouple business from wasting resources and offer alternatives for linear economy's destructive growth.

In the beginning of the thesis process, the idea for the thesis was to follow the same design thinking process, which is the backbone of the Purse, and do a thesis with more design point of view. Soon the author realized that there was no need for workshops or blueprints or personas or other service design methods in this work. The tools exist already, most of them are in use as such and their usability is tested with companies in several projects. That is why the methods that were chosen for the research are not service design methods, and the process is following the research process. The decision to take active research as research method was a good decision, because it allowed the author to take actively part in testing the tools. For the thesis process, the seminars along the way were important way to get feedback from teachers and other students, and they gave valuable ideas for the thesis. Also, the interviews with the research group were valuable part of the process.

To the question about what kind of tools and methods are in use, the answer is multiple. The backbone of the Purse is a design thinking chart introduced in the figure 2. That gives the headlines to the phases of the process and the tools to each phase are introduced in the same order. All together thirteen different tools and methods were chosen to the Purse, and they cover all phases of the design thinking process.

The tools were examined by their type, and what kind of facilitation is needed in using them. The study was done by interviewing the developers, observing the tools in use and testing the tools in practice. The tools were for example developer's paths, guides for arranging events for developing, templates for planning strategies or impact, and templates that can be used for collecting results or documenting them.

All the tools were not including circular economy or sustainability aspects as such. That highlights the importance of the facilitator's knowledge about circular economy, planetary boundaries and sustainable development goals for example. Also, facilitation skills were found to be important.

The second question asked what kind of processes in the projects lead to these tools and methods, and how to use them. The projects where the tools were developed are introduced as well as the ways to use the tools. Two of selected tools were developed further along this thesis process, the *SDG evaluation process* and the *Industrial symbiosis workshop organizer's workbook.*

Unite for all tools and methods was, that they are developed in a project, they are published as themselves or as process, and that they are tested in use with companies and organizations. For further use they are all to be collected to one webpage, everyone has an open access to them, and they are licensed with Creative Commons license. The tools and templates can be modified in many ways from surveys to workshops and use in different situations than they are meant. Ideas about how to modify the tools for different use are introduced together with every tool. The active researchers touch was crucial in observing, testing, and developing the tools further.

Behind these research questions stands the research group's way of working, that states that the companies and organizations can be helped to find new sustainable ways and circular economy solutions with these tools and methods. One way to help companies in sustainability shift is via different developing paths, facilitating the change with companies and providing information about the circular economy business models. The tools are answering to this. On the other

hand, the usage of the Purse could be developed further and implemented more via educating circular economy experts. That way the companies will get employees, who already know about circular economy, tools to support, and ways to facilitate the change. And because the tools are openly accessible, they can be used also by former students after graduating.

From this learning comes the suggestion, that the knowledge of the Purse and know-how of facilitation should be implemented to the circular economy education process. That can also be concepted into a service package for companies, so that their circular economy capacities increase through school projects where the tools are used, and they get to know students while they are still studying and are easier to recruit after they graduate.

Another suggestion rising from this process is, that the knowledge from previous projects should be used more while planning new projects. With developers open mindset the tools can be used in various ways to support the needs of the situation. Also, the knowledge of existing tools helps to develop new kind of tools that may be missing from the Purse now.

As limitations for this thesis can be seen, that there was no benchmark about other toolboxes, tools, methods, or platforms created by other higher educational institutes. Another limitation is, that even though it was planned in the beginning, all the tools and methods are not published in Finnish and English. The translation of the tools was left out because time limitations and there was no urgent need for translation eighter from the commissioner, the research group.

As limitations to the Purse itself can be seen, that there are tools, that are still missing. Some needs that rise during the process were for example a matrix for evaluating sustainability challenge, instructions for building and maintaining sustainability ecosystems and a matrix for evaluating public procurement's sustainability and circular economy. The structure of the Purse gives guidelines for the research group to develop even better tools in the future. Now when it is published, it is also easier to add new tools into the Purse and plan how to get

most out from the tools that are already there. The Purse can be found from the research group's webpage kiertotalous2.fi.

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