DESIGNING FOR A CIRCULAR ECONOMY

- *Exploring how service system design can support the transition towards a circular economy in Amager East*

MASTER THESIS

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- Exploring how service system design approach can support the transition towards a circular economy in Amager East

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ABSTRACT

This thesis examines how the methodological approach of service system design can support in transitioning a local urban district towards a circular economy.

The research is approached through a case study which allows a practical exploration of how applied service system design methods and techniques can support the organisation Miljøpunkt Amager in creating local initiatives that enable the urban district of Amager East to transition toward a circular economy. Methods such as desk research, interviews, journey mapping and workshops were carried out in order to suggest concrete initiatives.

The study reveals that transitioning towards a circular economy in urban areas are complex because the transformation can not only be reached in different parts of a company's value chain but also to different degrees of sustainability. When designing concrete circular economy initiatives the design space is therefore highly dependent and influenced by the context as well as determined by the transformer's capability and core business.

The study exemplifies how a practical service system design approach is capable of embracing the complexity of designing for a circular economy by identifying circular design opportunities as well as producing desired and valuable design solutions for service provider, user and the environment.

KEY WORDS

Circular Design, Circular Economy, Design for Sustainability, System Design

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ABBREVIATIONS

MPA: Miljøpunkt Amager
LE: Linear economy
CE: Circular economy
ARC: Amager Ressource Center

THESIS OBJECTIVES

This master's thesis has been approached based on a set of objectives aiming to develop my knowledge, learning and practical skills within the field of service system design.

The objectives draw together both official study objectives and personal study objectives.

OFFICIAL STUDY OBJECTIVES

KNOWLEDGE

- Must have knowledge about the possibilities to apply appropriate methodological approaches to specific study areas
- Must have knowledge about design theories and methods that focus on the design of advanced and complex product-service systems

SKILLS

- Must be able to work independently, to identify major problem areas (analysis) and adequately address problems and opportunities (synthesis)
- Must demonstrate the capability of analysing, designing and representing innovative solutions
- Must demonstrate the ability to evaluate and address (synthesis) major organisational and business issues emerging in the design of a product-service system

COMPETENCIES

- Must be able to master design and development work in situations that are complex, unpredictable and require new solutions (synthesis)
- Must be able to independently initiate and implement discipline specific and interdisciplinary cooperation and assume professional responsibility (synthesis)

- Must have the capability to independently take responsibility for own professional development and specialisation (synthesis)

(Curriculum for the Master's Programme in Service System Design, 2012)

PERSONAL STUDY OBJECTIVES

KNOWLEDGE

- Knowledge about how design and a design approach can contribute in the transition towards a circular economy
- Knowledge about designing in a systemic worldview

SKILLS

- Being able to make qualified design decisions based on thorough design research
- Being able to make qualified decisions about the use of practical service design tools, methods and techniques
- Expand my knowledge and tool set within practical service design
- Master the essential methods and techniques of service system design and be able to make decisions about when and how to apply the specific methods.
- Identify problem areas and address problems through design solutions.

COMPETENCIES

- Structure, execute and accomplish an entire design process independently
- Be able to show and master a service design process
- Mature as a service designer in order to feel confident about knowledge of the discipline and master its methods and techniques.

INTRODUCTION

INTRODUCTION

Every year since the 1970s, the day when humanity has used more natural resources than the planet can regenerate in one year is marked and given the name “Earth Overshoot Day”. In 2018 this date fell (01.08.2018) earlier than ever before (Global Footprint Network, 2018).

Today we need 1,7 Earths to supply human consumption and the figure will only increase as a growing world population, expanding urbanisation and rising global middle class will contribute to a higher consumption rate (Andrews, 2015).

To imagine the consequences of such a forecast is difficult, but we now already see issues connected to overconsumption. For instance, the challenge of plastic waste, where both animals and the environment are affected by human behaviour.

This challenge portrays just a small aspect of the broader waste and environmental problems the global community faces and, sadly, just a preview of what the future might bring if we continue producing, consuming, transporting and living as we do.

The paradigm of circular economy, which in its pure form is a society where waste does not exist, offers hope for a more sustainable future. In a Danish context, politicians and prominent business leaders are joining forces to explore how to transition towards a more sustainable future by changing to a society-driven circular economy. However, going from theory and ideas to developing and implementing actual change is the challenge.

Some argue that designers will and should play a key role in creating and making this transition and that design approaches are capable of embracing the complexity of the situation. This master thesis will therefore examine how the discipline of service system design can support actors in their work transitioning toward a circular economy by creating suggestions for potential future initiatives.

THE BACKGROUND AND MOTIVATION FOR THE CHOISE OF THESIS THEME

My motivation for choosing this area of research occured from my professional interests. First of all, I have an interest in how design and designers can contribute and accelerate sustainable and social innovation. Furthermore, I am curious about local communities and the relations and value exchanges that might occur when being linked to a specific geographical area. The combination of these two areas of interest led me to the organisation Miljøpunkt Amager.

Miljøpunkt Amager is an organisation that develops and implements projects with sustainable and environmental character in the specific urban neighbourhood Amager East, aiming to create value for and with residents-living in the area.

Based on my areas of interest and the core of Miljøpunkt Amager's work, I saw an ideal opportunity for a fruitful collaboration. Several relevant projects, that would have provided a meaningful foundation for collaboration were introduced by Miljøpunkt Amager. Based on a joint decision, a collaboration with the project Green Loop City was established. The aim of Green Loop City is to explore the potential for how Amager East can transition towards a circular economy by establishing new circular initiatives.

My thesis and research in design for a circular economy will therefore be a case study based on the project Green Loop City. I will investigate and explore how the discipline of service system design can be used to explore the potential for establishing new circular initiatives, by designing new service systems or redesigning existing systems to support Miljøpunkt Amager in accelerating the transition of Amager East towards a circulating economy.

The knowledge generated from this case study aims to contribute to overall understanding in how the discipline of service system design can contribute and support the transition towards a circular economy in a local urban context.

RESEARCH QUESTION

How might the methodological approach of service system design support the transition towards a circular economy in local urban areas?

THEORETICAL FRAMEWORK

THEORETICAL FRAMEWORK

In the following section, the underlying theoretical framework of service system design will be introduced.

The chapter will begin by clarifying why the approach of service system design was chosen as the methodological approach to answer the given research question. Furthermore, the theoretical framework of service system design will be introduced in order to outline the foundation for knowledge creation within the discipline. Finally, the methodological approach and the methodology will be presented as well as the design framework used to navigate and structure the design process of the case study.

DESIGN IN A REAL WORLD

According to Nelson and Stolterman, design is the ability to change towards a desired future by combining the reasoning and judgement of science and the creativity of the arts (Nelson, G. & Stolterman, E. 2012).

Given Nelson and Stolterman's definition, design is an approach to change real world conditions towards a desired future and the approach of design offers a way of solving real world problems.

Dealing with problems in the real world, designers will in most cases work with problem spaces with considerable complexity, also defined as "wicked problems" (Rittel, J. & Webber, M. 1973). "Wicked problems" are problems with great complexity for which there is no correct answer or simple solution. There are simply no rules of when to stop solving the problem and no correct answers for when the problem is solved (ibid.).

Approaching "wicked problems" through design as an approach to problem solving, Nelson & Stolterman further argue that the methodological approach of design manages to embrace the complexity of real-world problems by allowing the consideration of different possibilities, the complexity of choices and the challenges of designing it right, which makes the approach highly suitable for solving complex problems (Nelson & Stolterman, 2012).

DESIGN IN A SYSTEMIC WORLD VIEW

Since the real world involves dealing with ”wicked problems”, Nelson and Stolterman conclude that designers must be systemic thinkers (ibid.). When working in, and designing for, the real world, nothing happens in a vacuum, which makes it necessary and essential for designers to identify essential value constellations that are found in the real world (ibid.). It can therefore be argued that service system design takes a systemic worldview.

The core of system theory and system thinking states that “*the whole is characterized not only by its parts but by the relations between the parts as well*” (Ropohl, G. 1999). According to Vargo & Lusch, a system exists when an action or a service is not possible to execute by a sole actor, but includes a network of actors integrated into a constellation of value creation (Vargo & Lusch, 2004).

When services are designed within a systemic worldview, services unfold in service systems, which are complex systems consisting of people, artefacts, technologies and components that interact with each other and with other service systems to co-create value (Patricio, L. 2011). Value is therefore co-created through ongoing interactions among multiple stakeholders and affected by institutions or institutional arrangements (Normann, R. and Ramirez, R. 1993).

Creating innovative solutions in a systemic worldview is seen as an evolving adaptive process, where new disruptive solutions will emerge from an interactive co-creation exchange (Sempels, C. & Hoffman, J, 2011).

Innovative solutions can therefore be found in existing institutional constellations and infrastructures, which is classified as the redesign of an existing system (ibid.). But as Sempels argues, referring to Mont and Emtairah, the most refined system innovation embraces designing new infrastuctres, spatial planning and incentive systems (Mont, O and Emtairah, T. 2008, ref in Sempels, C. & Hoffman, J. 2011).

The design approach and focus of the discipline of service system design is therefore centred around designing the system components and the networks of value constellations to make the whole service system more than the sum of its components (Patricio, L. 2011).

METHODOLOGICAL APPROACH

Acknowledging that design happens in a systemic world view, the body of service system design naturally takes a holistic approach to design, aiming towards creating solutions that add value for both service users and service providers through an interdisciplinary approach (Mager and Sung, 2011).

A holistic design approach reflects systemic thinking by recognising that services are an interconnected whole that is part of a larger world of products, people, actors, places, processes and activities, and it is in the relation between these parts that value is created (ibid.). Service system design therefore interferes with social, organisational and economic structures which gives the discipline an interdisciplinary and practical approach.

Interdisciplinarity (and transdisciplinarity) means that the discipline of service system design combines methods and tools from various disciplines such as sociology, computer science and economics, among others (Abnor, I & Bjerke, B. 2009).

Moreover, the design approach aims to create solutions that are usable, useful and desirable for service users as well as efficient and effective for the provider of the service, which is the nature of service design as user-centred and co-creative (Mager & Sung, 2011). A user-centred and co-creative approach means that users are seen as reactive informers, but the research is led by an expert with an expert mindset (Sanders, L. 2008). Therefore, involving users and stakeholders in the different steps of the design process is essential for being able to design the best solution for both service user and service provider.

METHODOLOGY

Case-based study

On the basis of the theoretical framework, the core of the thesis is based on a case-based study, which gives the thesis a practical approach by following service system design principles and methods to make decisions. Given that the scope of the case study is provided by Miljøpunkt Amager, their interest and stake in the project have also been influential in decision making as a co-creative process, which is enabled by the discipline.

The collaboration with Miljøpunkt Amager involved regular meetings with Claus Knudsen, managing director. Miljøpunkt Amager was interested in a close collaboration which means that I had a desk at Miljøpunkt Amager's office. Being able to work at their office provided opportunities to access the knowledge and networks of employees at the organisation.

Divergent and convergent thinking

Striving towards creating the best solutions for both users and service providers is the ultimate purpose of the discipline. Most essential therefore is how knowledge is collected, generated, analysed and processed in order to move towards an ideal solution.

The design process evolved through a shift between convergent and divergent thinking, leading the case study from research towards a solution. Shifting between exploring and collecting data and insights, and processing, analysing and reflecting upon the insights, drives the progression and decision-making in a design process (Brown, 2009). Being aware of the shift between the two modes of thinking, indicates when and how to apply certain service design methods and techniques that support the design process in the right direction. Furthermore, the shifts between the two modes of thinking make the design process iterative, since the direction for the final solution is developing as knowledge is processed, which might lead to the insight that more information is needed in certain areas before being able to move forward.

Research and Data triangulation
Throughout the study I have mixed research approaches, between desk research, participant approach and co-creative workshops. When gathering data, triangulation has been a valuable technique to validate and support findings in order to get a more valid dataset (Stickdorn, M. 2018).

FRAMEWORK FOR THE DESIGN PROCESS

As mentioned above, the direction for the design process evolves and is shaped as information is gathered and analysed. Since the solution to the process is unknown from the very beginning, it can be useful to structure a design process. For this purpose several frameworks have been developed, the most well-known of which are Design Council's *Double Diamond* (Design Council, 2005) and IDEO's *5 Steps Human-Centered Design Process* (Dam, R. & Siangm T. 2018).

None of the frameworks dictate the design process, but rather suggest different stages of knowledge in the design process according to divergent and convergent modes of thinking. Furthermore, the design frameworks imply a set of actions which can help direct the choice for the most beneficial methods and tools.

Both the above mentioned frameworks support an iterative design process. While IDEO's *5 Steps Human-Centered Design Process* frames the empathic approach, it is too focused on dividing the design process into phases. The *Double Diamond* approach manages to support the understanding of a design process as a much more organic process, in which the direction is shaped by the knowledge that is gathered and analysed.

Figure 1 shows the design framework which has been used to navigate the design pro-

cess. The framework merges the *Double Diamond* framework and IDEO's *5 Step Process.* The *Double Diamond* model is used in the background of the illustration to visualise the organic and dynamic design process as well as to illustrate where divergent and convergent thinking is supporting the process. In front are the steps of IDEO's model, to emphasise which mindset should be dominating each mode of thinking.

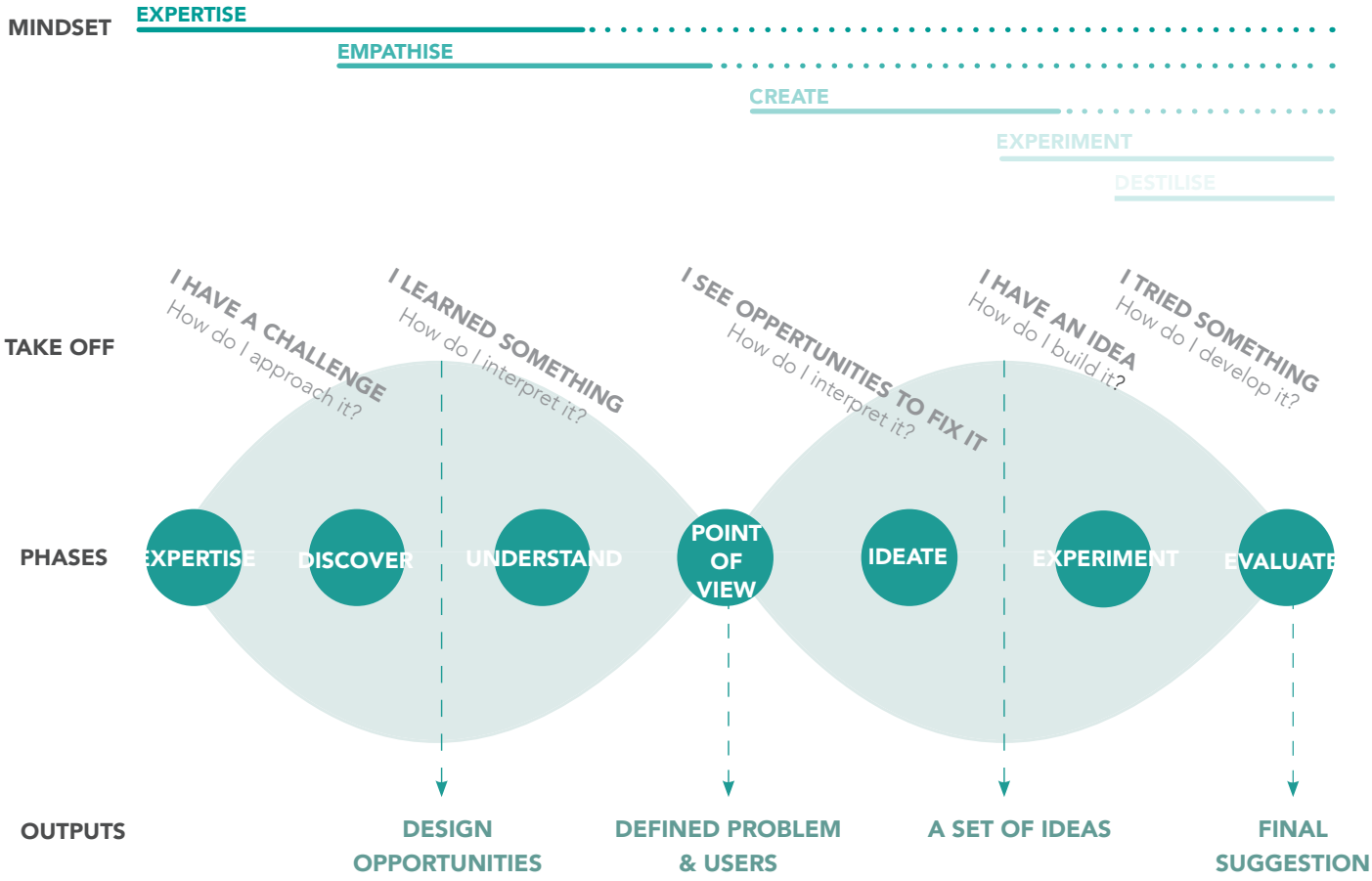


Figure 1: Design process

CASE STUDY

THE CASE STUDY

To outline the foundation of this case study, the section will begin with an elaboration of the case in order to provide context. This includes an introduction to the organisation Miljøpunkt Amager which has provided the case and have been a collaborating partner throughout the design process. Finally, this section will present the initial problem formulation as the starting point for the design process.

THE CASE

The focus of this case study originates from the project Green Loop City, established by the organisation Miljøpunkt Amager in 2018. It aims to identify opportunities and develop initiatives that can contribute to change the Copenhagen neighbourhood Amager East towards a local circular and sharing economy (Miljøpunkt Amager, 2018). In particular, through Green Loop City, Miljøpunkt Amager wants to investigate and initiate new initiatives for how Amager East can optimise the use of resources by re-using and circulating local resources (ibid.).

The case study will therefore explore how the approach of service system design can contribute to fulfill this objective. Furthermore, the case study aims to design solutions that can be carried out by Miljøpunkt Amager.

INTRODUCING MILJØPUNKT AMAGER

Miljøpunkt Amager (MPA) is a private, indepdendent organisation working on developing, improving and supporting environmental and sustainable projects in the local neighbourhood of Amager East and West (see picture 1).

The organisation was founded in 2003 by Amager Business Committee and Amager local councils and is driven by funds from Amager local councils (see Figure 2: Organisational structure) (Miljøpunkt Amager, 2018).

Since MPA is driven by public funds from the local councils of Amager East and Amager West, the projects that MPA initiates need to be relevant to these local councils. Engaging and involving local residents is therefore a central aspect of all MPA's work.

MPA's main focus areas:

- Share and communicate their knowledge about the environment and sustainable development to local residents
- Participate in environmental projects and events
- Share information and knowledge about environmental issues and politics
- Provide nature experiences on Amager
- Provide the link between residents and public authorities
- Encourage local residents to develop and initiate their own sustainable projects through economic support and/or consulting

(ibid.)

Picture 1: Map of Amager East

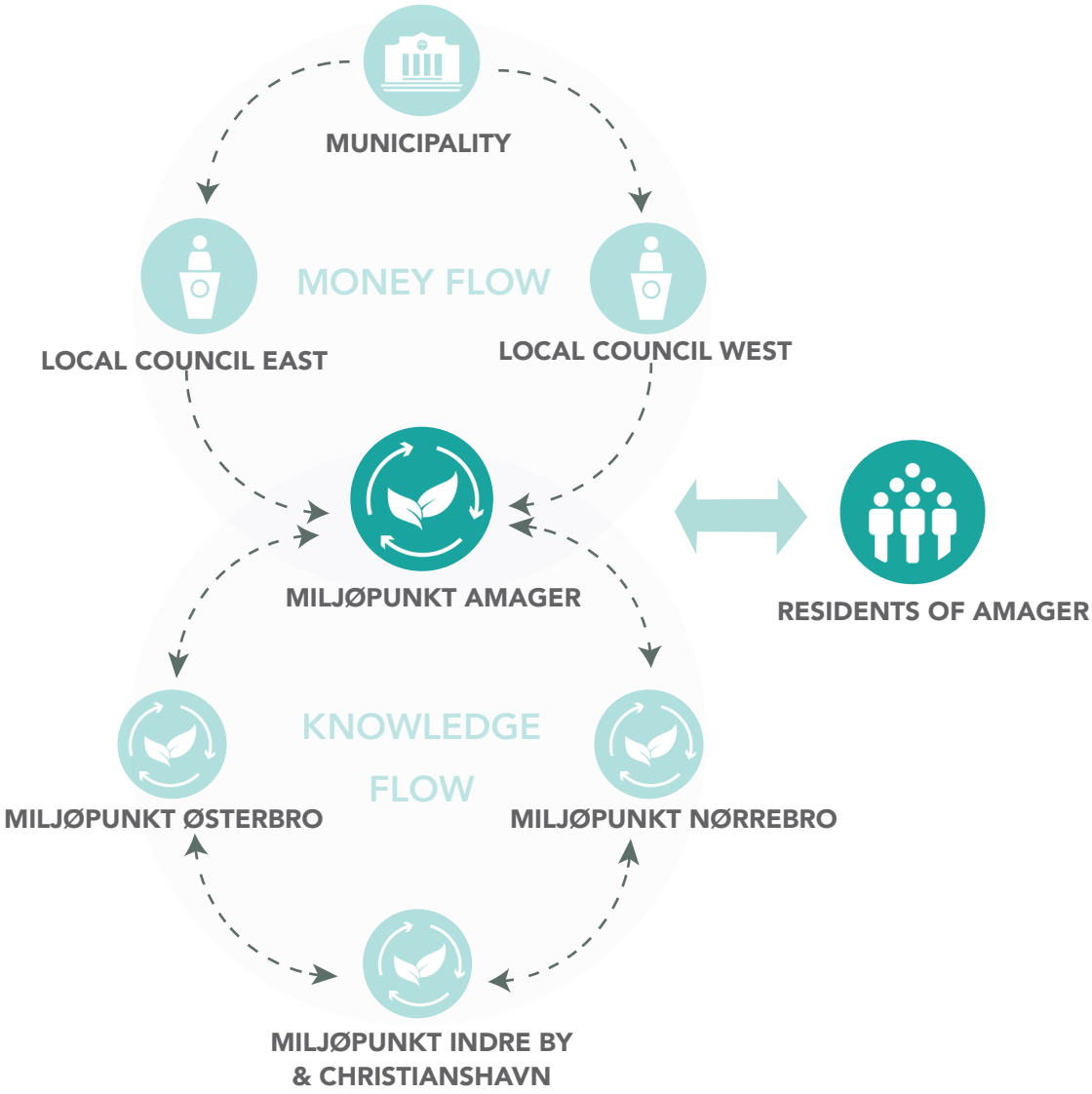


Figure 2: Organisational Structure

With a local perspective at the core of its operations, MPA is, at the same time, in a network of four environmental hubs. Each hub operates independently in a specific area of the Municipality of Copenhagen and uses the network to exchange knowledge, experiences and ideas. This provides a network with the opportunity to collaborate across local areas to fulfill common interests.

INITIAL PROBLEM STATEMENT

To secure a meaningful and rewarding collaboration throughout the thesis, the initial formulation of the problem was made in collaboration with MPA and will investigate and explore how service system design can contribute to design new local initiatives, systems or services that can support the transformation towards a circular economy.

PROBLEM FORMULATION

How might service system design support Miljø-punkt Amager in establishing initiatives that drive the Copenhagen neighbourhood of Amager East towards a local circular economy?

STARTING POINT

DESIGN SPACE

To reach MPA's future ambitions of establishing more local initiatives that can drive Amager East towards a circular economy, the current situation and condition has to be changed. It is between the current condition and the prefered future that we find the design space (Gray, D. 2010).

Figure 3: Design space

The problem statement frames a prefered future, a goal which contains uncertainty and no ultimate answers or solutions. When there is no given solution, the methodology of approaching such a design space can not be designed in advance, nor can the outcome be fully predicted (ibid.). This means that there is no set plan for how to reach MPA's prefered future, other than approaching the design challenges with an open mind and intuition that are founded by the methodological approach of service system design (ibid.). It is the open idea of a prefered future that will guide the design process towards a solution.

STARTING POINT

Circular Economy
A solid foundation of knowledge about circular economy was required in order to get an understanding of the boundaries and aims for the design space.

The contextual situation
It was essential to analyse the context in which MPA is working to identify if and where there is potential for MPA to transform current conditions towards the prefered future of circular economy.

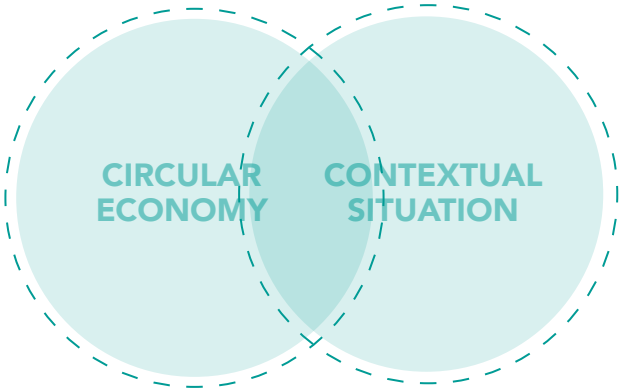


Figure 4: Areas of investigation

EXPERTISE PHASE

EXPERTISE PHASE

To understand the principles and theory of circular economy (CE) the design process began with desk research. The following section will show the findings from desk research which was a process driven by divergent thinking to open up the design space.

Transitioning towards CE will need a change in today's economic paradigm, known as the linear economy. In order to illustrate how these two economic paradigms contrast to one another, a clarification of today's dominant economic model is essential. Moreover, the chapter will cover why a shift in paradigm is needed, as well as present the beneficial potential and positive impact a transformation towards CE can bring, focusing on both an international and Danish perspective.

CIRCULAR ECONOMY

To clarify the principles and advantages of CE, the following section will begin with an introduction to the linear economy (LE), followed by an introduction of CE.

A SOCIETY DRIVEN BY A LINEAR ECONOMY

Referred to as the "*Take-Make-Use-Dispose-Economy*", the general perception of LE is that produced goods and products are waste when the life of the product ends (Andrews, D. 2015). The core of LE is illustrated in the model below. As seen in the model, the life cycle of a product can be divided into 5 stages (see figure 5: Linear Economy).

A SOCIETY DRIVEN BY A CIRCULAR ECONOMY

In a circular economy, waste does not exist. This means that products are not seen as waste when they lose value or functionality, but instead they are considered as material that can re-enter in new contexts and relations (Andrews, D. 2015). The main aim when designing in the paradigm of CE is to design

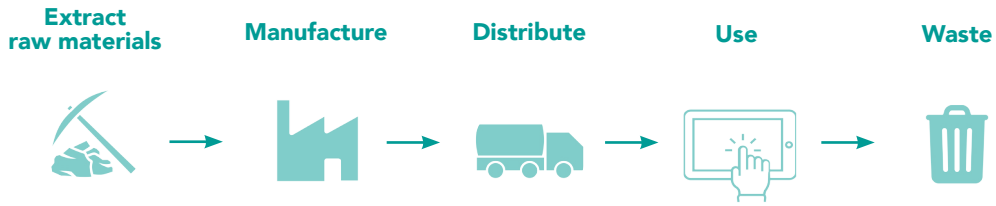


Figure 5: The model of linear economy

waste out of existing systems, which opens up the possibility to prolong the life of products, goods and resources (ibid.).

The Ellen MacArthur Foundation, a British charity founded in 2010 to accelerate transition to a circular economy, defines three principles that should change today's economic model:

- Design waste and pollution out of the economy
- Keep products and materials in use
- Regenerate natural systems

(Ellen MacArthur Foundation, 2017)

The idea of CE was introduced in the 1970s by Walter Stahel, a Swiss architect and economist, who proposed that materials be processed in loops in order for waste to become a resource. He named this "*Cradle to Cradle*" and LE as "*Cradle to Grave"*. He identified extending product life through repair and re-manufacturing (ibid.).

THE MODEL OF CIRCULAR ECONOMY

The model below (see figure 6: The model of circular economy) is developed by the Ellen MacArthur Foundation and illustrates how to utilise the life of products in the most optimal way (Ellen MacArthur Foundation, 2017).

The illustration captures the core of CE and provides a valuable tool for identifying oppor-

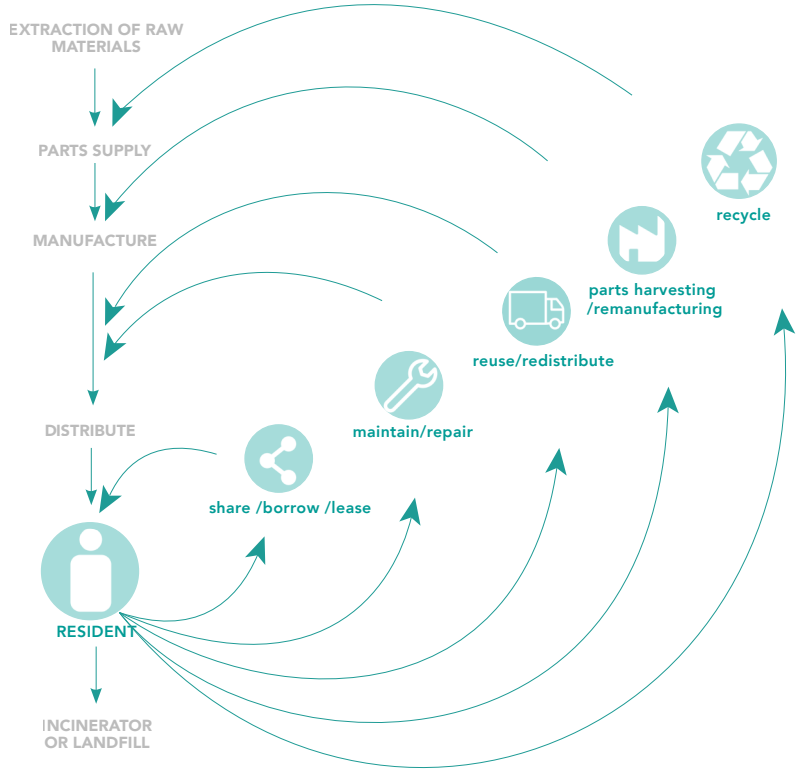


Figure 6: The model of circular economy

tunities where it is possible for MPA to work with CE in a local context.

The model shows that the closer the loop is to the user, the more sustainable a solution is, since the resources will be utilised to its maximum potential. This means that the further a solution or a system is from the user, the more resources and energy it takes to manipulate products into materials that can be integrated in new contexts (Iles, J. 2016).

Circle 1. "Sharing". By sharing or leasing resources and products, the goods will be fully used, it lowers waste and duplication, which again will lower private consumption and production of products.

Circle 2. "Maintain/Repair". By maintaining and repairing products, the life of products is extended and resources reach their full potential.

Circle 3. "Reuse/distribute". By reusing and redistributing products, the life of products is prolonged, since the products are integrated in a new context that gives them new value.

Circle 4. "Parts harvesting". This loop is where it is possible to reuse parts of resources in new systems.

Circle 5. "Recycle". This is where the material of the products or resources are manipulated into new material for products and integrated in new loops.

(World Economic Forum, 2013.)

Service economies
The three circles closest to the user are about sharing, redistributing or maintaining products to prolong their life. In order to do so, development of new services will be the main driver to support and facilitate such innovation (Ellen MacArthur Foundation, 2017).

Re-manufacturing materials
Circles 4 and 5 both focus on manipulating products and goods into materials that can be used in new systems or as parts in new products. In the two furthest circles, remanufacturing of products is the driver of changes (ibid.).

THE CIRCULAR VALUE CHAIN

Another valuable model for companies to analyse and identify opportunities and potential for transforming their business towards CE is the circular value chain (see figure 7: Circular value chain). Developed by the Danish Advisory Board in the report *Anbefalinger til Regeringen* (Suggestions for the Government) it identifies circular potential in the production value chain, which should be divided into three main areas 1. Design and Production, 2. Consumption, and 3. Recycling (Danish Advisory Board, 2017).

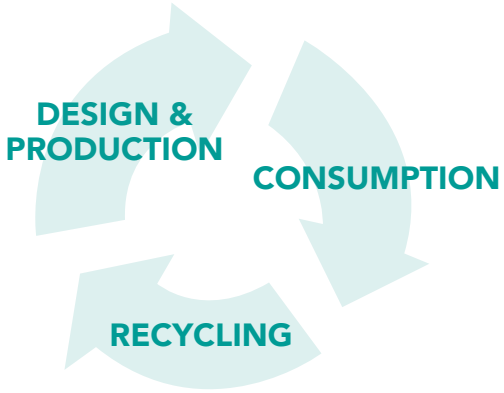


Figure 7: Circular value chain

WHY WE NEED THE PARADIGM OF CE?

LE has made an important and positive impact in changing and developing our society and has benefited creative, manufacturing and retail industries, as well as energy suppliers and raw material producers, which have all led to wealth production and a major positive impact for the lives of millions of people (Andrews, D. 2015). That LE is today's dominant economy has been fostered by historical reasons. LE was born along with the 1st and 2nd Industrial Revolutions and ideas such as Planned Obsolescence during the Great Depression strengthened the impact of LE (ibid.). In the 1960s, LE was further strengthened when it was economically cost-effective to buy new materials instead of recycling them (ibid.).

But along with the positive impacts in wealth and living conditions, LE has had and will continue to have serious negative consequences. Natural resources such as minerals are finite and many reserves are already limited (ibid.). In the twentieth century more minerals, fossil fuels and metals were consumed than in any other centuries put together (Andrews, D. 2015).

In approximately 30 years from now, it is expected that there will be 9,6 billion people on earth and 70% of the global population is expected to live in cities. First of all, it is shown that urban residents generate twice as much waste as people living in the countryside (ibid). Furthermore, along with population growth and urbanisation, the global middle class will likewise grow.

The combination of a growing world population and wealth will raise demands considerably and it is already shown that extraction of raw materials, manufacturing and other industrial process do have a direct impact on global climate, weather patterns and ecosystems, which will results in future flooding, damage to health and well-being, crop failure and mass migration (Andrews, D. 2015 ; Advisory Board for Cirkulær Økonomi, 2017).

The demands are and will continue to increase if, we do not change the mass consumption and overproduction that today's economy supports. Based on the consequences outlined above, it is clear there is a need for an alternative sustainable model, which is what circular economy is proven to be (ibid.).

THE POTENTIAL OF CIRCULAR ECONOMY

Changing towards a CE, it is argued that it will benefit and improve many aspects of today's society both environmentally but also in terms of the economy and living conditions.

To mention a few environmental benefits, changing towards CE can reduce the high consumption of raw materials as well as the import and export, thereby lowering pollution that comes with the transport industry. This will result in reducing carbon dioxide emissions which again will have positive effects on the environment and can prevent issues such as the displacement of millions of people because of crop failure, sea level rise and extreme weather conditions (Ellen MacArthur Foundation et. al. 2015).

But with a society driven by economic growth, environmental consideration are not enough to change society. There is a need for an economic gain before businesses starts the transformation from today's unsustainable model. It is this which makes CE a promising alternative sustainable model.

According to the Ellen MacArthur Foundation, CE will not only have a positive impact on the environment, but, as argued in the report *Growth Within: A Circular Economy Vision For A Competitive Europe*, CE can create economic growth since it will lower material savings and production costs by the recirculation of resources. Furthermore, changing towards CE will create new jobs across business sectors and will increase GDP in Europe by 11% in 2030 and 27% by 2050, which compared with the linear economy would be increasing by 4% in 2030 and 15% in 2050 (Ellen MacArthur Foundation, 2015).

This is summarised by the Ellen MacArthur Foundation by the following: "Transitioning to a circular economy does not only amount to adjustments aimed at reducing the negative impacts of the linear economy. Rather, it represents a systemic shift that builds long-term resilience, generates business and economic opportunities, and provides environmental and societal benefits" (Ellen MacArthur, 2017).

CIRCULAR ECONOMY FROM A DANISH PERSPECTIVE

There is a high awareness of CE from a top political level in Denmark. In 2016 the Danish Government founded the Danish Advisory Board for Circular Economy, which consists of 12 leading business people aiming to develop a vision and specific goals for how the industrial sector can change towards a CE (Advisory Board For Cirkulær Økonomi, 2017). Furthermore, in 2015 The Ellen MacArthur Foundation made a case study of the economic potential for Denmark to transform to a circular economy (Ellen MacArthur Foundation, 2015). This study showed that by steering the business potential towards a CE, the Danish economy could create

economic growth, new jobs, raise exports and reduce the use of materials and CO^2 gases (Ellen MacArthur Foundation, 2015). According to the report, Danish society could create an annual economic gain of 45 billion DKK in 2035 which would create thousands of new jobs and raise the GDP by 0.8-1.4%. (Ellen MacArthur Foundation, 2015).

The idea of CE is now slowly starting to make an impact, not only at the top political level but also at the level of municipalities among local politicians and other local actors, such as Miljøpunkt Amager.

But how to move from the theoretical level to a larger practical level and actually start to develop and implement CE initiatives is a big challenge.

DISCOVER PHASE

DISCOVER PHASE

In parallel with desk research, the context in which MPA is operating was analysed to identify opportunities where MPA could create initiatives that could move Amager East towards a circular economy.

By structuring the design process according to the design framework presented in the beginning, this chapter will cover the discover phase of the design process.

The discover phase is where designers strive to get an understanding of the problem area by immersing themselves into the topic through consulting experts as well as engaging with people to understand their motivations and experiences in relation to the given problem area (Plattner, H. n.d.).

This phase has been approached through a mix of different methods and techniques such as key-informant interviews, ethnographic field research, system mapping, qualitative interviews and a workshop. The combination of the different methods and techniques generated valuable insights which have been important for creating an overview of the context as well as narrowing down the focus area for the further design process.

KEY-INFORMANT INTERVIEW, CLAUS KNUDSEN

CLARIFYING THE PROJECT BOUNDARIES

According to Marger and Sun, service design strives to design solutions that are valuable for both user and service provider. Furthermore, the solution has to be feasible and realistic from the perspective of the service provider (Mager and Sun, 2011).

In this respect, the first step is to create an understanding of MPA's capabilities, resources and challenges as an organisation in order to understand the boundaries and limitations of the design space.

KEY-INFORMANT INTERVIEW WITH CLAUS KNUDSEN

To clarify MPA's intentions and stake in the Green Loop City project, an informal key-informant interview was conducted with Claus Knudsen who is the center leader of MPA.

An informal interview has no set structure and is closely connected to the format of a casual conversation about a given theme. This format can be useful at the beginning of a research process to start building an overview of key actors and components (Schjödt, U. 2018). A key-informant interview is related to an ethnographic interview, where the interviewee is seen as an informant whose perspective you are trying to understand (Høgsbro, H. 2018).

Through an informal interview the inten-

tion was to let Claus Knudsen share his thoughts, interest and knowledge about the field, as well as the goals of the Green Loop City project.

KEY INSIGHTS

5 criteria were established as the desired achievements of the Green Loop City project (see figure 8: Key insights).

1. To make circular economy practical instead of theoretical
2. To make circular economy visible and tangible
3. To make circular economy initiatives locally anchored
4. "Best practice". To establish initiatives that can be used to inspire others
5. To make it self-driven through local actors

Figure 8: Key insights

Prior to the meeting, the projects in which MPA are currently working on were analysed and divided into two categories.

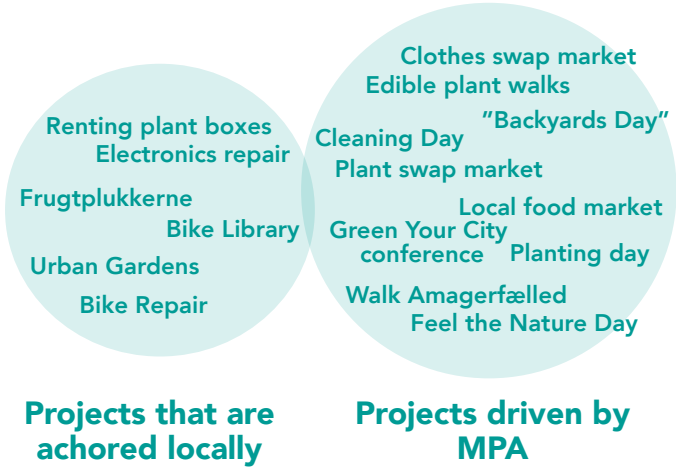


Figure 9: MPA's projects

What is significant from the illustration above (see figure 9: MPA's projects), is that most of the projects are driven by MPA. This means they are only happening occasionally, needs planning and would not exist without the initiative of MPA.

The illustration above also shows that only a few of the projects established by MPA are projects that are locally achored, meaning they are conducted without MPA's involvement and driven by local actors. When looking into the 5 criteria Claus identified for the outcome of the Green Loop City project, the hope and intention is for the Green Loop City project to be solution that are driven by local actors and the project therefore needs to involve local stakeholders.

Finally, it is worth mentioning that none of MPA's projects are based on technology, which is important to bear in mind when designing a solution that is realistic and feasible for MPA to impliment.

IDENTIFYING THE (CIRCULAR) DESIGN SPACE

The 5 criteria clarified the intentions and hopes for the Green Loop City project. Through desk research of circular economy, it is now possible to identify the space in which MPA is able to create changes towards a CE.

By analysing MPA's core business and capabilities in relation to the circular value chain, as well as the CE model, the boundaries for the design space were identified, which provided a direction for the further design process.

MPA & THE CIRCULAR VALUE CHAIN

Since MPA is not working with production or manufacturing of any goods, their space for developing new CE initiatives had to be focussed on initiatives that either change people's consumption habits, or initiatives concerning recycling (see figure 10: MPA's circular opportunities 1).

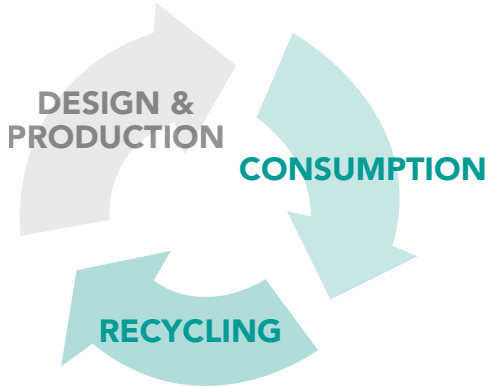


Figure 10: MPA's circular opportunities 1

MPA & THE MODEL OF CIRCULAR ECONOMY

MPA is an organisation working exclusively with services, which indicates that a feasible solution should aim to fit in the first three loops of the CE-model (see figure 11: MPA's circular opportunities 2).

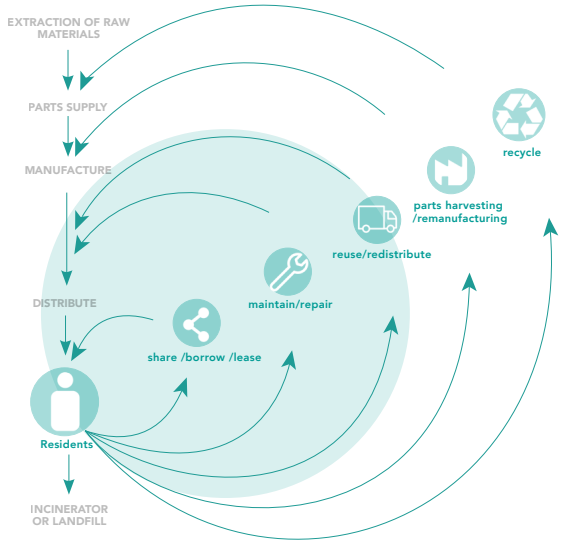


Figure 11: MPA's circular opportunities 2

INDENTIFYING THE PROBLEM AREAS

The identified scope for MPA to establish circular economy initiatives only outlined the boundaries for the design space. But it still did not identify any gaps or potential areas in the context of Amager East in which MPA could improve or change the existing condition towards a circular economy.

Therefore, an exploration of the local context of Amager East was needed to identify gaps or possibilities for MPA to optimise or change the current conditions towards a more sustainable solution within the boundaries of the design space.

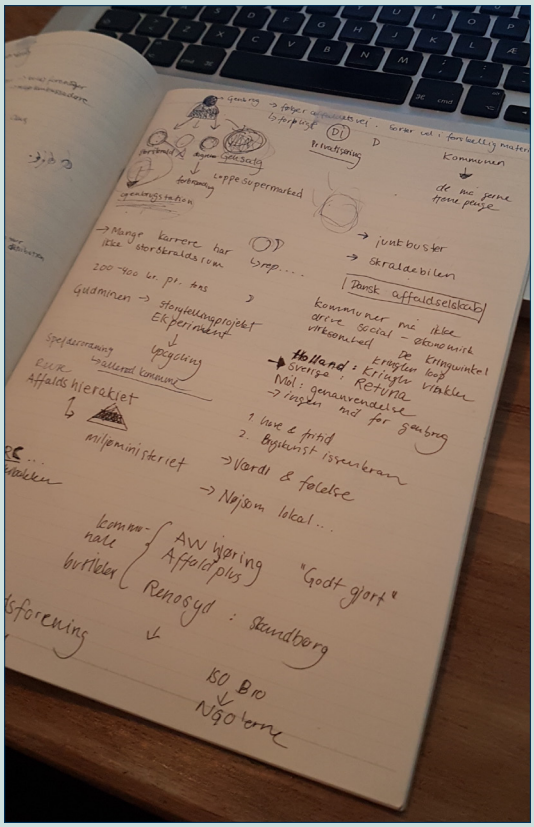
KEY-INFORMANT INTER-VIEW

During the interview with Claus, a specific case was mentioned concerning the fact that a high number of fully functional products today are being thrown-away and eventually incinerated. The interesting and problematic aspect of this case is that when fully functional products end in the incinerator it means that the products are getting burned and turned into energy, instead of being reused, repaired or redistributed, which in the CE model are more sustainable options.

This insight came from an internal report developed by a former employee working at a central Danish incinerator. To get a better understanding of the problem area, an interview with the former employee was arranged, hoping that the insights could lead to relevant paths for further investigation.

The former employee had signed a non-disclosure agreement when working at the incinerator and therefore the interview could not be recorded nor the name of the respondent be revealed. The former employee at the incinerator will therefore be referred to as Key-Informant, since the interview can be considered an unstructured key-informant interview (Bjørner, T. 2016; Schödt, U. 2018).

During the interview, field notes were taken and after the interview IDEO's technique "Download your Learnings" was used, to make sure that the insights and impressions were written down while having them clear in mind (IDEO. n.d.).



Picture 2: Field notes from interview

KEY INSIGHTS

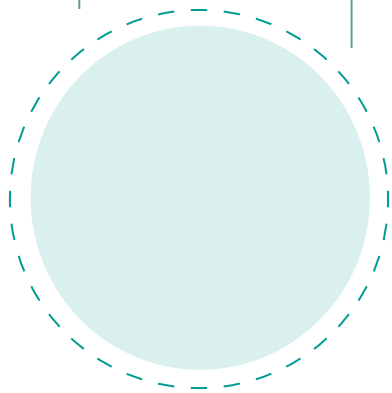
According to Key-Informant, the recirculation of used products can be roughly divided into 4 categories.

1. RE-SALE

People earn money by re-selling used products. Both online and offline resale opportunities exist, such as dba.dk, reshopper.dk, trendsales.dk, flea markets.

2. GIVE AWAY

People give their products to charity shops, friends, family or through online communities.



4. BIG WASTE

Public waste service for bigger waste in urban areas, which is provided through a collaboration between private housing associations and the municipality. The private housing associations provide a shared waste room for the residents living in the apartment complex where residents can deliver their bigger waste (mainly consumer goods such as furniture and other domestic waste that does not fit containers) which will then be collected by the municipality.

3. DAILY WASTE

Products ends up in daily waste containers that are normally intended for household waste.

Figure 12: Waste categories

Big waste is the real challenge

Looking at the category of ”re-sale”, Key-Informant meant that there already exist several offline and online options for re-selling used goods. Given this fact, it is already relatively easy and accessible for people to re-sell used products, makes it a competitive market for MPA to enter. Furthermore, the expert meant that the option, ”give away”, has only been strengthened with growing technology.

According to Key-Informant, the real problem and challenge is ”big waste”. In this category, functioning products are not considered as valuable and therefore treated as waste.

The actual problem was observed during the informant’s time working at the incinerator where an enormous amount of perfectly functional products ended up in the incinerator. At the incinerator, the functional products were burned and turned into energy because there was no interest or economic gain from the perspective of the incinerator for integrating the functional products in new contexts.

The expert further explained that in the moment when a product is considered as waste even if it is fully functional, there is only one system that deals with waste: the public waste system. In the moment when products are absorbed into the public waste system, all products are considered as having the same value. This means that no matter how good the condition of the products and materials are, everything is compressed into materials that can be recycled. The Danish public waste system is therefore only designed to decrease the inherent value of products.

In conclusion, the expert made it clear that there was potential in improving the current situation of ”big waste” towards a circular solution.

MOBILE ETHNOGRAPHIC FIELDWORK

VALIDATING THE INSIGHTS THROUGH RESEARCH TRIANGULATION

Based on the interview, a problem was identified which in the lens of CE has potential for improvement. To validate the expert's arguments, mobile ethnographic field research was conducted to document the situation of the big waste rooms.

Below is just a small selection of the photo materials gathered through field research, which clearly indicates that useful and functional products are being thrown out. (see pictures 3-5).

To support the photo material, desk research was done to explore if the problem was discussed in other contexts. During the research, the report "Idea Catalogue for the Big Room - Service" was found (Miljø og Fødevareministeriet, 2017). The report was produced by the Danish Ministry of Environment and Food in March 2017 and states that the majority of furniture and other products that are gathered through the big waste service solution are in most cases destroyed when collected because all gathered resources are going through a compactor (Miljø og Fødevareministeriet, 2017. p. 26).

Moreover, the report concludes that several municipalities are considering an alternative service solution for the big waste room, by focusing on increasing the potential for immediate reuse of the products from the big waste room. In the report, it further concluded that a potential solution has to run in parallel with the big waste service should collect the products before the big waste collection, because otherwise the products are destroyed during the collection of big waste. (Miljøstyrelsen, 2017).


Picture 3, 4, 5: Big waste rooms

REPRHASING THE PROBLEM STATEMENT

When looking at the insights collected from the Key-Informant, and supported by photo documentation, it is a problem that perfectly or nearly perfect functional products are being destroyed when collected from big waste rooms instead of being directly reused.

The situation concerning the big waste rooms is therefore an ongoing and actual problem in the current context of the Danish public waste system, which could be a relevant area for MPA to solve in a local context. Furthermore, the problem area also fits into the identified CE design space.

CHOICE OF DIRECTION

Based on the insight gathered from desk research, designing for a CE can evolve in several directions and be implemented in many parts of a value chain and more or less in all industries and businesses. It should be mentioned that the initial problem statement was approached through other methods and techniques to identify gaps in a local context, and several other directions for further research were considered and discussed during meetings with Claus Knudsen. However, considering time constraints, as well as being realistic about capabilities of working independently on this research project, it was necessary to narrow down the scope of the case study to create a more concrete and tangible focus.

Since a problem was identified in the big waste system, which also presented an opportunity for MPA to transform the current situation towards a more circular solution, it led to the choice of narrowing down the problem area to focusing on the optimisation of the life of used products within big waste rooms.

This decision led to the final problem statement:

FINAL PROBLEM STATEMENT

How might a service system design approach support Miljøpunkt Amager in creating a solution that supports resources in big waste rooms being utilised to their full potential?

ECOSYSTEM MAP

ECOSYSTEM OF REDISTRIBUTION OF USED PRODUCTS

Since creation of innovation in a systemic worldview is seen as the establishment of new value constellations in existing markets, by either transforming existing value constellations or creating new constellations, an identification of actors and components involved in the current ecosystem could help create an overview of the current ecosystem (Vargo, S. et. al. 2016).

According to Stickdorn, data visualisation can help create this overview of gathered data as well as help uncover gaps (Stickdorn, M. et al. 2018). Vargo supports this argument by suggesting that visualising a service-ecosystem helps researchers to consider new interactions among the actors involved in a given value creation and thereby broadens the scope for innovation (Vargo, S. et. al. 2016).

To understand the current ecosystem and where there could potentially be a gap for MPA to create a more sustainable solution, the visualisation of the current ecosystem had to capture the important actors, shareholders and components that are involved in the system as well as visualise the value creation.

In the ecosystem below, both indirect and direct stakeholders are mapped out in order to analyse their stake and interest in the given system. In the view of an ecosystem, the value constellation should be emphasised, which makes it a useful tool to identify the processes and components that are essential for the creation of value and thereby innovation (Vargo, S. et. al. 2016).

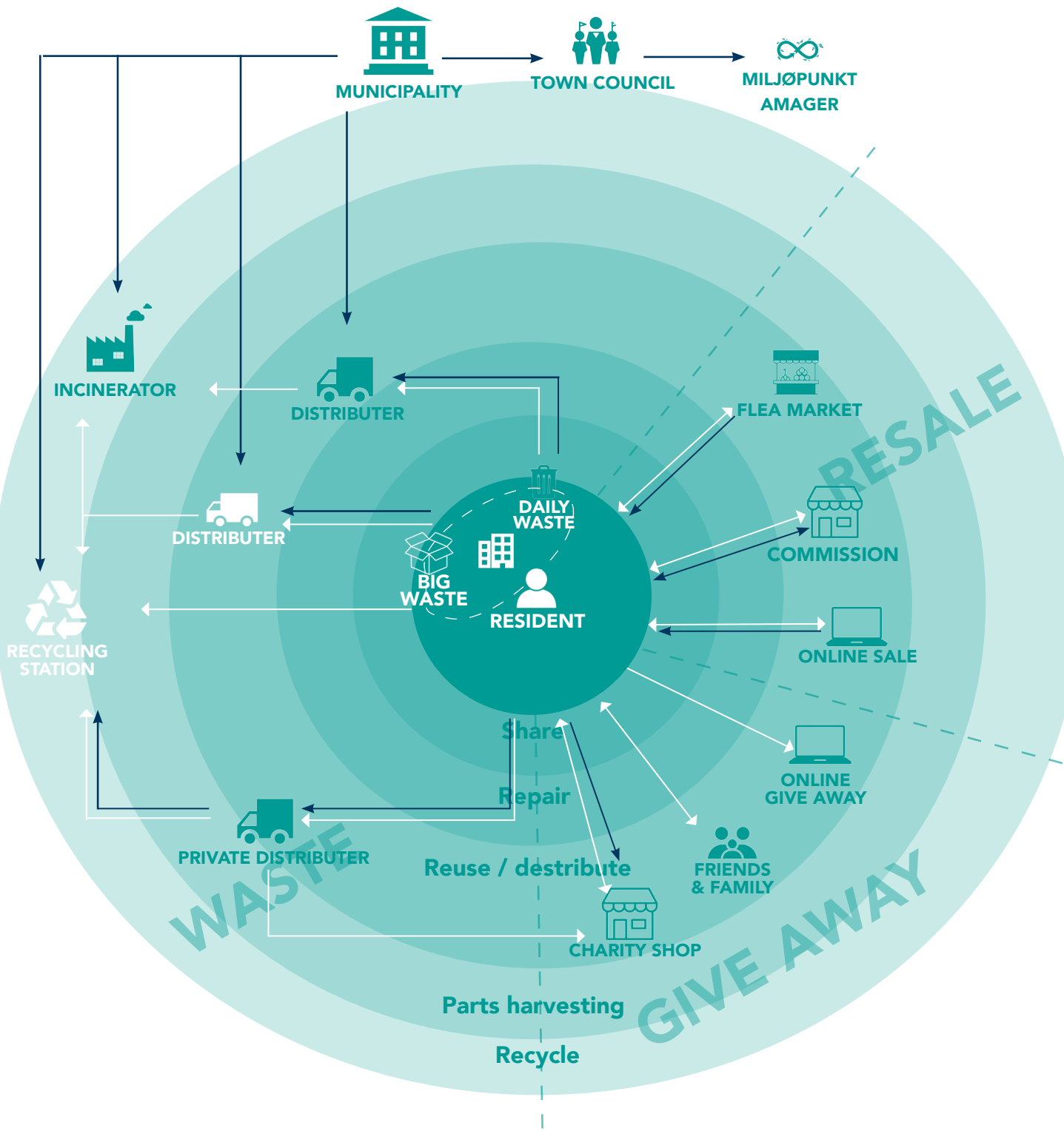


Figure 13: Ecosystem map

DECODING THE ECOSYSTEM MAP

The map represents the different options a local resident of Amager East has today when wanting to recycle a used product. In the centre of the model is therefore the resident.

The categories:
Based on the Key-Informant interview, the map is divided into three categories 1. Resale, 2. Give Away, and 3. Waste, where category 3 includes daily waste and big waste.

The background:
The 5 circles that constitute the background of the map represent the circles of the CE model. Except from the stakeholders that are placed outside the circles, all other stakeholders are placed according to the role they play in the view of CE.

The stakeholders that are placed outside the circles are indirectly influencing the actors that are placed inside the CE-model and are therefore important to include.

The hierarchy:
The stakeholders defined by white colour are the essential stakeholders in the big waste solution
The stakeholders defined by green colour are important stakeholders in the ecosystem of recycling products

The value exchange:
The white arrows represent the flow of used products
The blue arrows represent the flow of money

FINDINGS

By visualising the ecosystem of recycling and the involved actors, it becomes obvious that the journey of the used resources in the big waste service system ”jumps” directly from the inner circle to the furthest loop of the CE-model.

There are simply no options for the used resources to be integrated in one of the other loops closer to the resident, which in the lens of CE would be more sustainable.

From the insights gathered during the research, there are still functional products among the resources ending in the big waste room, and the fact that the product goes directly from being owned by the resident to being destroyed creates a gap for possible improvement.

The ecosystem furthermore helped to identify the essential stakeholders and components directly involved in the big waste service system which are 1. residents, 2. big waste rooms, 3. the housing association, 4. the distributer, and 5. the recycling station.

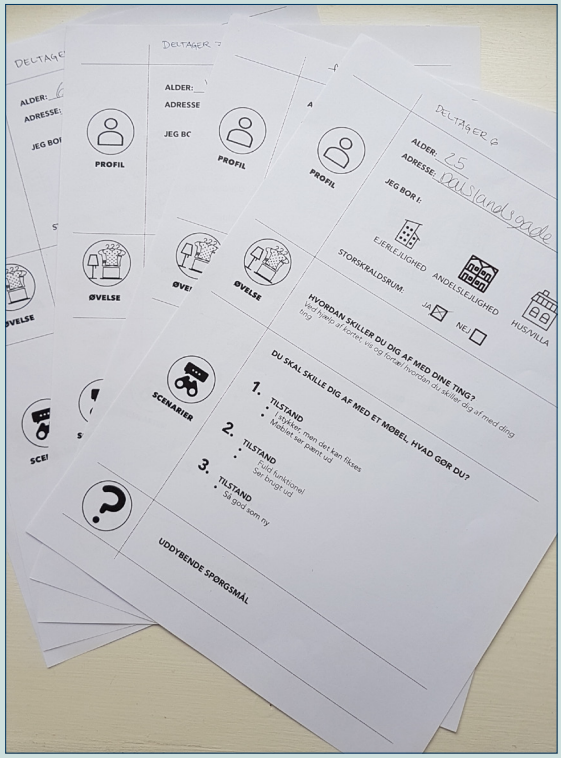
The challenge is now how to integrate the resources from the big waste room into one of the loops closer to the resident. Therefore a potential solution has to interfere with the existing system in order to prevent the products ending at the recycling station.

QUALITATIVE INTERVIEWS

UNDERSTANDING THE BEHAVIOUR

After creating an overview of the stakeholders involved in the ecosystem, there was a need for understand when, why and how local residents of Amager East deal with products they do not want anymore. In particular, to understand the conditions for when used products are valuable enough to be resold, when products are given to friends and families, or when products are treated as waste. Furthermore, it would be useful to clarify if having access to a big waste room affects people's behaviour when dealing with used products. To gather this insight, seven qualitative, semi-structured interviews were conducted.

To collect insights from a diverse group of people, in terms of age and living condition, interviews were conducted at the public library. To support the interviews and the boundaries for the space of investigation, a worksheet was created and given to respondents at the beginning of the interview (see picture 6: Worksheet). During the interviews fieldnotes were taken as well as documented through photo material (see picture 7-8: Design kit for qualitative interviews) and after each interview IDEO's method "Download your Learnings" was used (IDEO, n.d.).



Picture 6: Worksheet

WORKSHEET

The purpose of integrating a worksheet in the interviews, was to guide the interviews through 4 small exercises, which are described below.

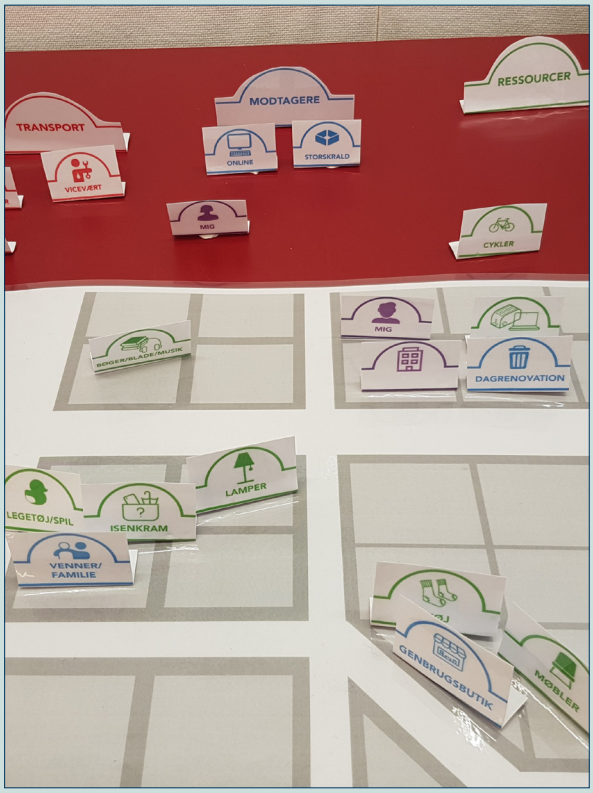
Exercise 1: First the respondents had to fill in demographic information to clarify age and living situation, and if they had access to a big waste room.

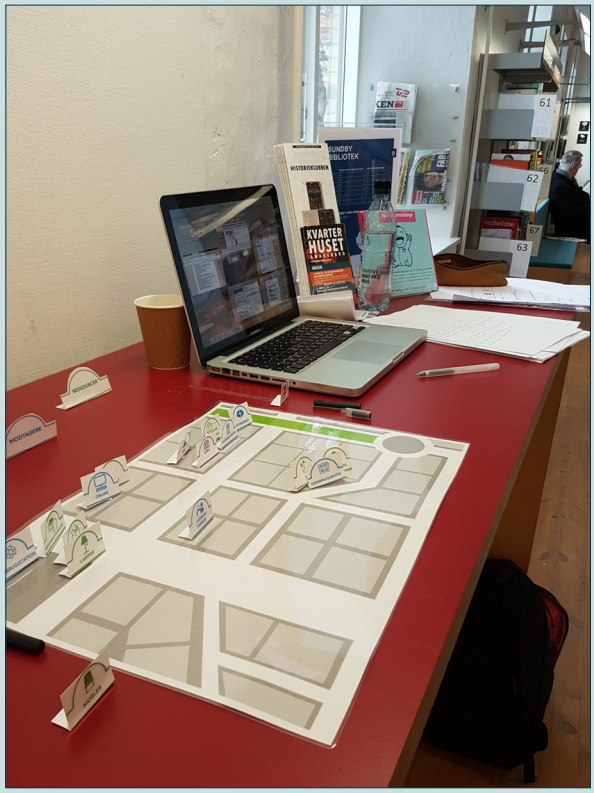
Exercise 2: 9 categories of products were defined and respondents were asked to

place each product category on a map to show how the different kinds of products were handled.

Exercise 3: After making the respondents explain their behaviour according to the different categories, 3 different scenarios were described for the respondents. The scenarios were made in order to understand and identify when the respondents are treating products as waste, as a product to resell, or as a product to give away.

Exercise 4: After describing the scenarios, some final questions were made.





Picture 7 & 8: Design Kit for qualitative interviews

FINDINGS FROM THE QUALITATIVE INTERVIEWS

The perceived value of the products
The most interesting insight from the interviews was the perceived value of used products. Most of the interviewees explained that they would never give their used products to friends, family or charity if the products were too worn-out or if they lost their functionality. Instead, they would throw out the products.

Why people are getting rid of things
Based on the insights from the interviews, it was possible to start grouping the reasons for why people are throwing away things. Reasons such as lost functionality or if the product was too warn-out were mentioned. But also conditions such as refurbishing a home or changed living circumstances created new demands. In addition, some respondents wanted to clean out their belongings or change outdated technology.

The big waste room = convenience
The majority of the interviewees explained that they never use the recycling station, but instead use the big waste room since it is much more accessible and has largely the same function as the recycling station. One respondent explained that he encourages his friends to stop by and pick up his used products from his flat, but if there is no interest among friends and family, the big waste room is the most convenient option, also if the products are fully functional.

Online behaviour
The convenience of the big waste room is also reflected in people's online behaviour. Most of the respondents did not use any online platforms when it came to products that have no value (in their perspective), since it is too big an effort to upload it to an online platform and then afterwards have to make arrangements with people to come and pick it up. It is just easier to throw the product away in the big waste room.

REFLECTION IN RELATION TO THE PROBLEM STATEMENT

The value that the individual resident assigns to the used product is a central aspect to bear in mind when designing a solution for reintegrating used products in new contexts.

In most situations, the used products are treated as waste, which indicates that the products have little or no value to the owner. The insights from the qualitative interviews also revealed that the fact of having no or little value to the owner means there is a limited interest and motivation for making a big effort to get rid of the used products. In this perspective, the function of big waste rooms is an optimal solution because it requires minimal effort for getting rid of used products. Urban residents do not have to consider what is actually happening to the products they do not want anymore, they just have to carry their waste to the shared big waste room and the public system will make

sure to collect it.

Since the role of the big waste room is already meeting needs of people as a convenient and accessible solution, it could be a challenge to design an alternative function and therefore it might be necessary to integrate the role of the big waste room in an alternative solution. An alternative solution might therefore be designed with the big waste room as the starting point.

The insights furthermore indicated that the products ending in the big waste rooms are left in different conditions. Some products are working, but others are worn-out and some need to be repaired. A potential solution therefore needs to embrace the different conditions of the products and has to consider the fact of adding value to used products.

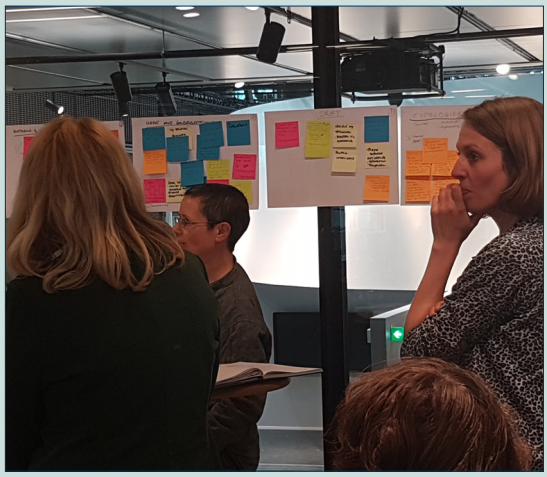
WORKSHOP

BLOXHUB - WHY WASTE A RECYCLING STATION?

During the discovery phase the two-days workshop “Why Waste A Recycling Station?”, facilitated by Smith Innovation in collaboration with Amager Ressource Center (ARC), was held at BLOXHUB[1]. The purpose of the workshop was to ideate and generate new ideas to solve the challenges that Copenhagen recycling stations are facing by focusing on circular economy and digitalisation.

Participating in the workshop provided an opportunity to get an inside perspective from the service provider of the big waste system, as well as an opportunity to explore what Amager Resource Center and the municipality of Copenhagen are currently doing to prevent functional products ending as waste.

The participants attending the workshop were a mix of people from different professions, such as designers, architects, entrepreneurs and consultants in circular economy, as well as employees of the recycling stations, which created a unique opportunity to gain insight, into an internal perspective on recycling stations and ARC.



Picture 9,10 & 11: Pictures from BLOX HUB workshop

[1]BLOXHUB is an urban innovation hub, located at the Danish Design Center, and aiming to bring together research, companies and organisations to co-create better future urban solutions.

FINDINGS FROM THE WORKSHOP

Direct Recycling is the future
The workshop began with a presentation by the manager of ARC, John Thesme, who introduced the challenges facing Copenhagen Municipalities' recycling stations. Inspired and affected by the growing awareness of CE, one of ARC's big areas of interest is to investigate how they can raise the percentage of direct recycling at the recycling stations.

The term "*direct recycling"* is used to describe resources, materials and products that can be directly integrated in new contexts without being turned into recycled materials.

Below is a graph showing statistics of how resources are currently recycled at recycling stations.

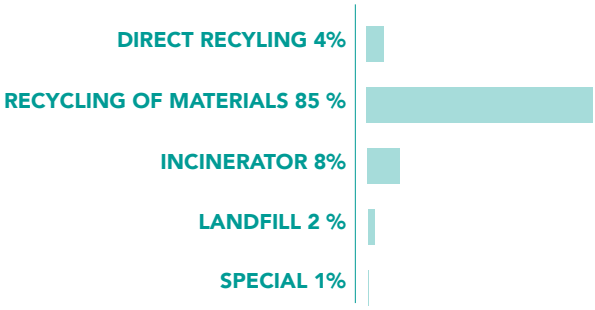


Figure 14: Statistics from recycling stations (Smith innovation, 2018)

The future goal for ARC is to raise the percentage of "*direct recycling*" from 4% to 20%. In order to reach these goals, John Thesme explained that resources and materials such as wood, furniture, textiles and applicants should be moved from the group, "*recycling of materials*" to "*direct recycling*".

An inflexible system
During the workshop, it was confirmed that the employees at the recycling stations do not have time to sort the resources and materials when the materials first enter the containers. This means that all resources, including functional products, are treated as waste when they reach the recycling station.

By looking at the statistics above, it can be argued that the public waste system is actually working quite effectively, since 85 % of the resources are being recycled. However, with a growing focus on circular economy and the direct use of resources, the functionality of recycling stations is not optimal anymore, since the current system is only capable of dealing with materials and resources in one particular way. This results in decreasing the inherent value of the products instead of adding or maintaining their value.

It was also mentioned at the workshop that laws and political constraints prevent recycling stations from restructuring the current system and services, which makes the system extremely inflexible and slows the capacity for changes to be made.

Interest in used products
Some Copenhagen recycling stations provide ”*swapping rooms*”. A swapping room is a place where residents can deliver functional products that other residents are allowed to take for free. At the moment all swapping rooms have to be guarded, because residents are getting into confrontations about the free resources. Furthermore, recycling stations often experience queues in front of the swapping rooms due to considerable interest in used products.

What is also notable is that recycling stations lock the containers during closing hours because otherwise they experience many break-ins.

REFLECTIONS IN RELATION TO THE PROBLEM STATEMENT

Participating in the workshop was valuable and created a new perspective on the context.

One of the most valuable insights was concerning the fact that there is still an interest in the resources at the recycling station among residents. First of all, this knowledge highlights the fact that resources are still valuable and have the potential to be integrated in new contexts, without having to be destroyed and turned into recyclable materials. Furthermore, it emphasises the issue that resources which residents consider valuable are being destroyed.

The paradox lies in the fact that when resources and products are deposited into the public waste system they are in the property of the municipality, but because employees at the recycling station do not have the time to sort the materials, law and political constraints hinder optimisation of the current functionalities and residents are not allowed to take materials from the recycling station that are not placed in the swapping room. There is nothing that can stop the ongoing system from demolishing valuable resources after they have entered the public waste system. Through the lens of CE, it is an issue that the current system is not capable of treating resources differently.

What makes it even more dysfunctional is that, apart from steel and copper, all other resources ending at the recycling station are an expense to the recycling station. The recycling stations must pay external stakeholders to handle the different materials in order for the materials to be recycled.

Taking these considerations into account, a solution must create an incentive for the recycling stations to increase the amount of direct recycling, as it will lower the expenses to external stakeholders and at the same time benefit residents.

Given the fact that the public waste system is so rigid, the knowledge gathered from participating in the workshop raised questions such as, is the public waste system capable of changing? And, should the design solution be developed as an alternative system,

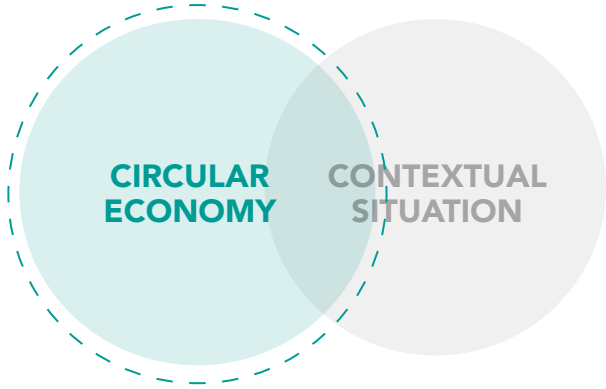
preventing valuable resources from being deposited in the current waste system? An alternative system capable of supporting value creation from resources in the big waste room and making sure that resources are utilised to their full potential.

DEFINE PHASE

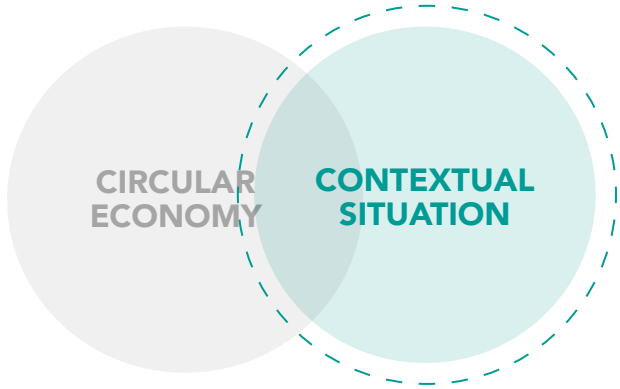
DEFINE PHASE

At this point a large number of insights and fragmented pieces of information were gathered from the different approaches. Therefore a full overview of the data was required in order to be sure not to miss out on important insights that could help in designing a solution for the given problem area.

*The define phase is where the designer strives to bring clarity to the information she or he has collected, and to create a focus for the design space in order to frame a specific area of intervention (Plattner, H. n.d.). To help in this process, a mix of different methods such as IDEO's method "*Download Your Learnings*" and the "*KJ technique*" were used. The key insights were then summarised in a Design Manifesto in order to bring the design process to the next phase of ideation and towards a solution.*



- Desk research



- Key informant interview with Claus Knudsen
- Key informant interview with incinerator expert
- Field research
- Qualitative interviews with residents
- BLOX HUB workshop

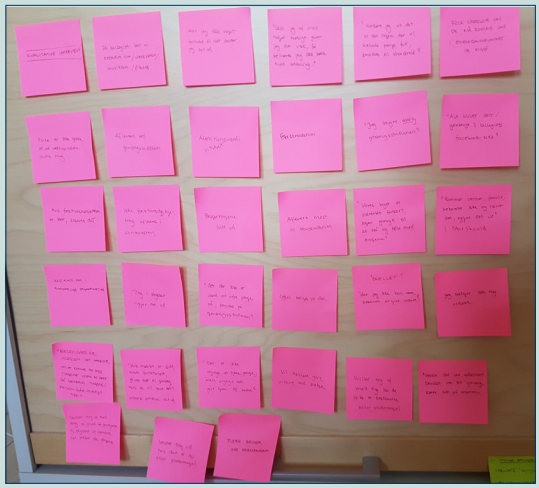
Figure 15: Applied methods

CREATING AN OVER-VIEW

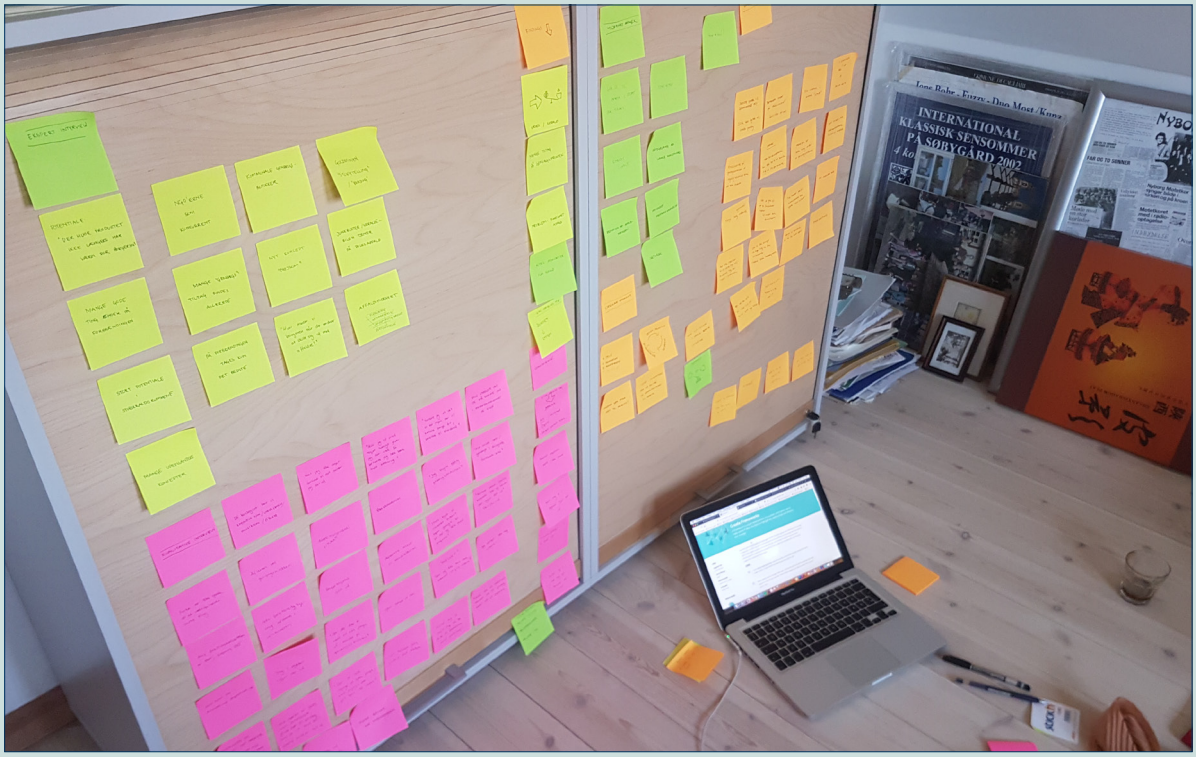
DOWNLOAD YOU LEARNINGS

To structure the process of creating a systemic overview of all gathered data, IDEO's method *"Download Your Learnings"* (IDEO, n.d.) was used. It offers a simple but useful technique for getting knowledge, insights and stories on to paper.

All the insights gathered from the different interviews and methods used throughout the expertise and discovery phase, all knowledge were written down on Post-It notes, which were turned into a "Research wall" (Stickdorn, M. 2018). (See picture 13: Research wall).



Picture 12: Download your learnings



Picture 13: Research wall

THE KJ - TECHNIQUE

By itself, the ”Research wall” is a visual representation of all the data gathered during the design process. There was therefore a need for extracting meaningful insights from the data in order to guide the design process further. For this purpose the KJ - technique was used, also known as ”affinity mapping” (see picture 14: KJ - technique). The technique is developed to create priorities among subjective, qualitative data by identifying patterns and themes (Spool, J. M. 2014). The technique comes from ethnography and was developed as a tool for analysing ethnographic data and has also been used as a management tool for decision making and for fostering creativity, because the methods are beneficial for exploring new links and patterns among data (Scupin, R. 1997).

Picture 14: KJ-technique

CREATING INSIGHT STATEMENTS

From the KJ-technique, 13 clusters were identified which were turned into 13 insight statements by using IDEO's "Create Insight Statements" method as a foundation for creating a Design Manifesto (see figure 17).

The method helps to highlight the most important insights from the research phase by identifying the most valuable aspects that can drive the design process from the large body of knowledge collected, and point you in the direction towards a solution (IDEO, n.d.).

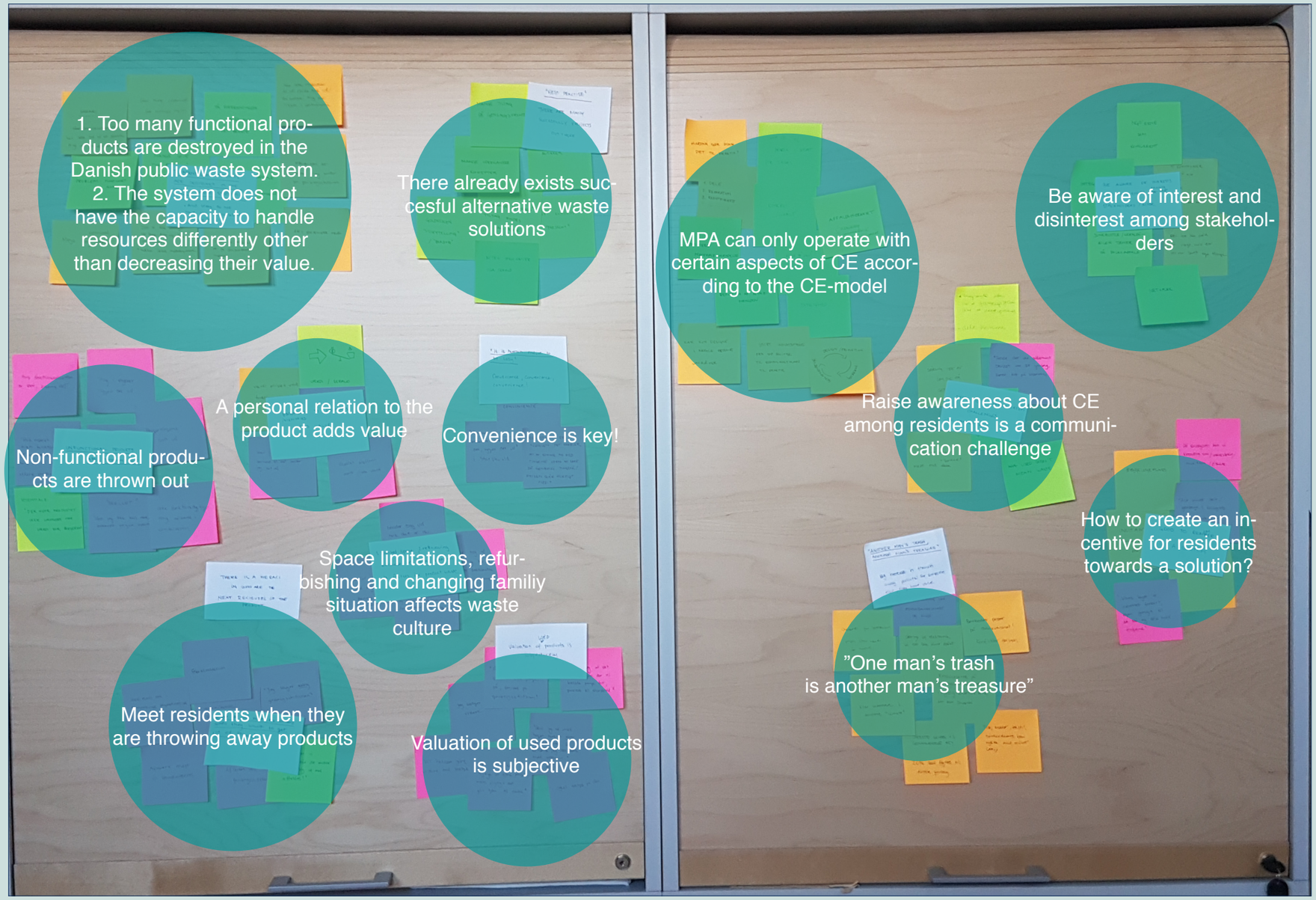


Figure 16: Creating insight statements

DESIGN MANIFESTO

After creating insight statements, they were turned into a Design Manifesto which is shown on the following page. The purpose of creating a Design Manifesto is to frame the design challenge in a short and precise way by summing up the most important insights gathered from the research phase to be used as a framework for giving directions for the ideation phase (see figure 17: Design Manifesto).

THE PROBLEM

Every year tons of reusable materials and perfectly functional products are absorbed in the big waste system. But the Danish waste system is only designed to destroy the added value of the materials and products. This means that as soon as materials and products are integrated into the big waste system, no matter the condition of the products, everything is destroyed in order for the products to be turned into recyclable materials.

WE KNOW

In the lens of circular economy, utilising products to their full potential by prolonging products' life cycle as long as possible is the most sustainable form of consumption. Recycling resources is therefore the very last step of a product's lifecycle.

KEY INSIGHTS

- Big waste rooms are a key component in today's waste system. They function as the meeting point between private consumers and the public waste system
- Waste has no value for the previous owner and therefore the motivation for doing something "extra" is low
- Value is subjective and "waste" is often valuable to someone else
- Things are thrown out when they are worn, defect or replaced

WE WANT TO AVOID

- Being a competitor to any existing social enterprises, such as charity shops
- Designing a solution that is not feasible for Miljøpunkt Amager to impliment
- That good resources, materials and products are ending up in the Danish public waste system

"Reclaim The Resources"

A SOLUTION SHOULD

- Be feasible for Miljøpunkt Amager to impliment
- Benefit the local community of Amager Øst
- Stop fully functional products and valuable materials from ending at the public waste system
- Be a self-driven activity
- Create an incentive for local people to engage

BEHAVIOUR

It is important to know that products have little or no value to their previous owner. The motivation for doing something extra is low.

THE GOAL

To design an alternative system that creates an opportunity for resources to be integrated into new contexts either by sharing, repairing or redistributing, in order for the materials and products to be utilised to their full potential.

Figure 17: Design Manifesto

IDEATE

IDEATE

Based on the Design Manifesto, the boundaries and aims for a future design solution were defined, which made it a natural step towards the ideation phase. This is where the designer combines understanding of the problem space with the designer's imagination to create a solution that solves the identified problem space (Platter, H. n.d).

The ideation phase was approached through creative and systemic methods in order to develop ideas that could solve the identified problem area.

GENERATING IDEAS

To begin the ideation phase, brainstorming is probably the best-known group idea-generation approaches and could have been a natural approach for starting to develop ideas (Isaksen, S. G. 1998). But when looking at the collaboration with the team from MPA and their involvement in the design process, the collaboration was mainly based on consultations and meetings and the foundation of knowledge was therefore not shared with anyone in the MPA team. Considering these circumstances, brainstorming as an approach for generating ideas was not the most optimal approach for creating a meaningful and useful outcome.

Instead, the ideation process was initiated through a logical thinking approach, which in a design process means that design decisions are based on rational and analytical thinking (Mazariegos, C. 2012). It is argued that developing solutions based on a logical approach can limit the generation of ideas, but if the logical decision approach is combined with a creative way of thinking it can be a useful way of making design decisions (ibid.).

INITIAL DESIGN THOUGHTS

According to system theory, innovation is created when services and processes are optimised by designing new ways of fulfilling needs within existing networks of value

creation and infrastructures (Mont, O and Emtairah, T. 2008, ref in Sempels, C. & Hoffman, J. 2011). But as stated in the theoretical section, innovation also embraces the design of new infrastructures, spatial planning and incentive systems (ibid.).

Looking exclusively at the problem statement, a next step could have been to redesign and optimise the existing system. For instance, to rethink and redesign the space of the big waste room in order for the used resources to look more inviting and thereby insure that more resources are being circulated among people living in a housing association. Or, perhaps, to redesign the service of the big waste collectors so that the resources are not destroyed when they are collected. Or even design a digital service to support the recirculation of the resources ending in the big waste room.

All these design directions would have been interesting ideas for further investigation, but since this case study is provided by MPA, the ideas being developed during the ideation phase need to include and consider MPA as a value-creator in a potential solution. A future solution, aiming to utilise products from the big waste room to their full potential, therefore has to be realistic in the perspective of MPA and, furthermore, be incorporated in the current infrastructure in order to build new value creation networks, where MPA is an actor.

DESIGNING THE STRUCTURE OF A FUTURE SYSTEM

To initiate the generation of ideas, the Relevance Tree Diagram (RTD) method was employed. The technique was originally developed for managing knowledge from research, but can also be suitable for stimulating ideas because it supports an intuitive way of thinking and is a powerful way of conveying information (Bowkett, S. 1997). RTD is particularly useful for system thinking because it helps to manage complexity by dividing knowledge into subdivisions (Burge, S. 2015).

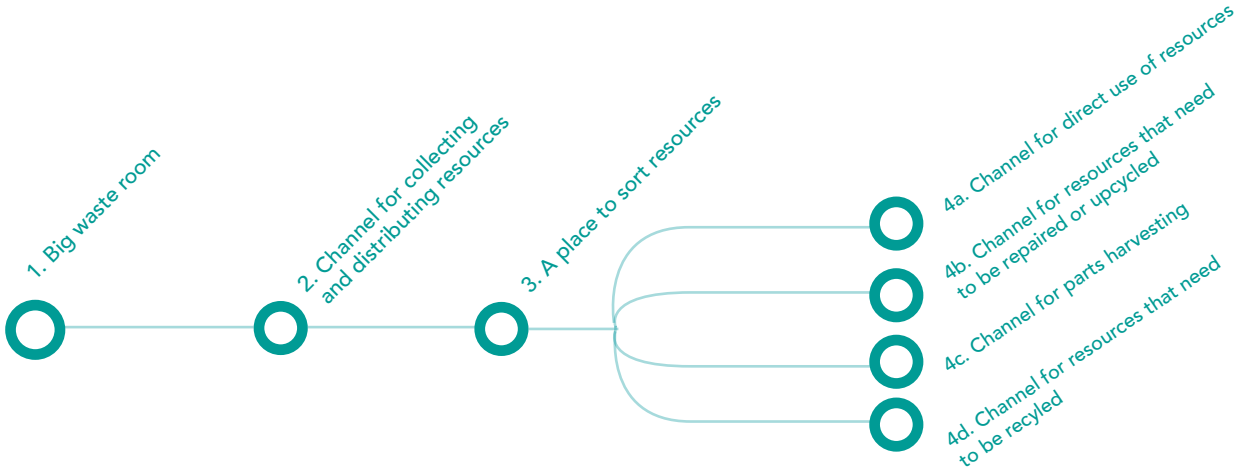


Figure 18: System structure #1

1. Big waste room. Based on the research, the big waste room is a critical component of the current waste system because it offers an easy way for residents living in an urban neighbourhood to get rid of things, they do not want anymore.

2. Channel for collecting and distributing resources. As the qualitative interviews indicated, the resources ending in the big waste room have little value to their former owner, which affects people's willingness to make a big effort when getting rid of their used products. As mentioned earlier, it is therefore worth acknowledging the convenience of the big waste room as well as people's reluctance to spend effort when getting rid of products. Since the big waste room is already a reality in an urban context such as Amager East, as well as in the rest of Copenhagen, it means that if the resources are utilised to their full potential, a future solution needs to embrace the role of the big waste room but include a component that can collect resources without compressing them.

3. Place to sort the resources. Based on the knowledge gathered from in-depth interviews and field research, the resources

gathered from the big waste room will be in different conditions and will require sorting. If resources from the big waste room have to be collected and sorted, there will need to be a physical place to gather the resources.

CONDITIONS AND NEEDS

4a. Channel for direct use of resources. Some resources will be fully functional and can be directly reused.

4b. Channel for resources that need to be repaired or upcycled[2]. Some resources may be broken or too worn out to be directly reused and therefore the solution needs to contain an option where resources can be repaired or upcycled.

4c. Channel for parts harvesting. Some resources may be too broken to repair, but include parts that can be reused.

4d. Channel for resources that need to be recycled. Some resources may not be posible repair and need to be recycled.

[2] *"To upcycle (something) in such way that the recycled product has a higher value than before" (Definition from Mirriam-Webster Dictonary)*

BENCHMARKING

The system structure generated through the approach of the RTD, indicates the fundamental components or functionalities needed in an alternative system that can optimise utilisation of resources from the big waste room to their full potential.

Based on the identified components and functionalities, a benchmark was carried out on existing solutions that are operating today within the field of recycling in order to further the idea generation process.

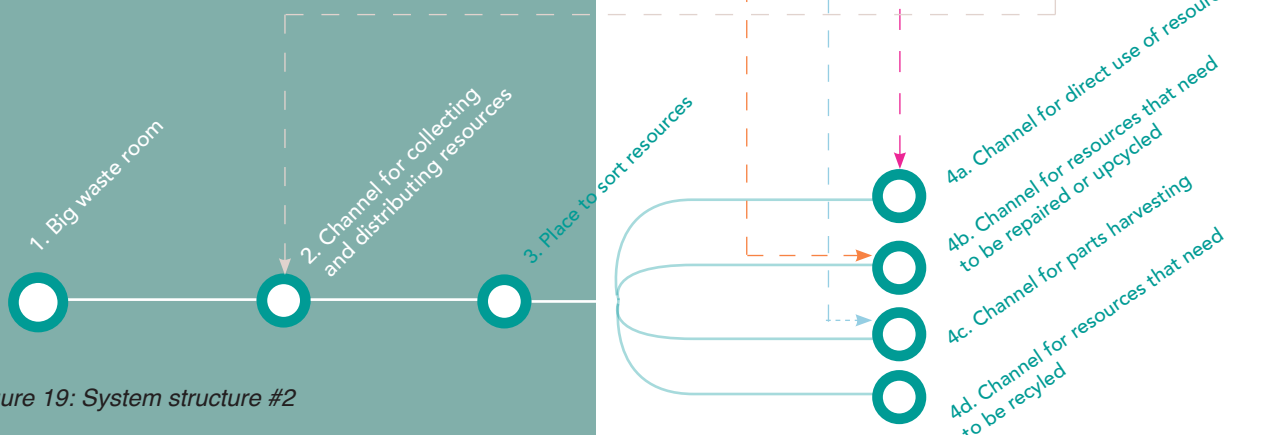
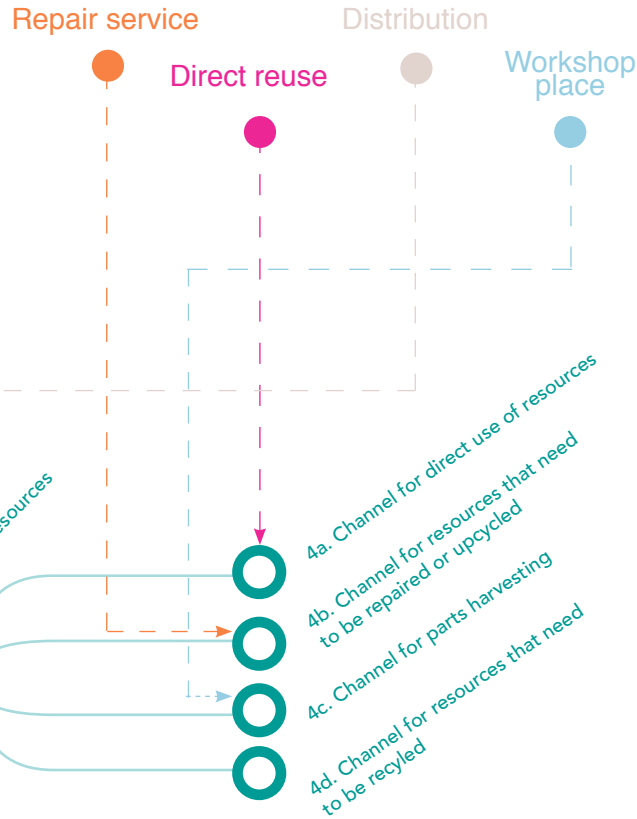


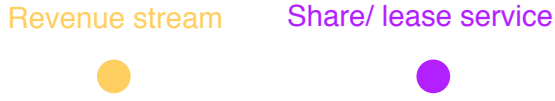
Figure 19: System structure #2

Benchmarking is originally defined as a systemic approach to compare competing businesses, but the method can be applied in many ways and will in this case be used to compare existing cases in order to get inspiration for developing ideas (e-conomic, n.d.).

NEEDED FUNCTIONALITIES



BENEFICIAL PARAMETERS



Repair Cafe (DK)

Pop-up cafes around Denmark allowing people to repair their broken items.

Source:
https://repaircafedanmark.dk/

Junkbuster (DK)

A private company providing a service that includes picking and transporting domestic waste to the recycling station for Copenhagen residents.

Source:
www.junkbusters.dk

Facebook Groups (online service)

Facebook communities where people share free things among members. I.e. ”Sydhavnens Bedste Karmagruppe”.

Source:
https://www.facebook.com/groups/Sydhavnensbedstekarmagruppe/

Byttemarked, Amager (DK)

Pop-up markets at Amager where people can swap clothes and goods for free.

Source:
https://www.facebook.com/events/1737169036535213/

Elektronik værkstedet (DK)

A shop established by MPA, where volunteers fix electronics for free.

Source:
https://www.facebook.com/elektronikvaerkstedet/

Odense Kit (DK)

A ”sustainable” library where people can borrow kits, such as birthday kit, fishing kit, costume box.

Source:
https://www.odensebib.dk/baeredygtigtbibliotek

FreeMi App (DK) (online service)

FreeMi is an app where people can upload items they do not want anymore in order to find a new owner for the object.

Source:
https://freemi.dk/

Naboskab (DK)

Naboskab is an urban project where empty cabinets are placed in public spaces to encourage people to recycle used items within their neighbourhood.

Source:
http://naboskab.dk/

Skraldebilen (DK)

Private company where residents pay for getting their waste picked up and recycled

Source:
https://www.skraldebilen.dk/

Fleamarkets, Copenhagen (DK)

Markets where people sell second hand products

Refill (UK)

A water bottle refill system in the UK, where cafes and stores allow residents to refill their water bottle.

Source:
https://www.refill.org.uk

Clothes Swap, Helsinki (FI)

Public clothes swap station in Helsinki, Finland.

FurniHelp (UK)

A service gathering old furniture in order to give to students for free. People pay 20 pounds for getting their old furniture picked up

Source:
http://www.furnihelp.co.uk/

Community Wood Recycling (UK)

A social enterprise that recycles wood waste. They collect, re-use and re-sell used timber.

Source:
http://www.communitywoodrecycling.org.uk/

dba.dk (online service)

Online platform where people re-sell used items or give then away for free

Source:
dba.dk

Øresundskollegiet (Dorm) (DK)

A zero-waste ecosystem. The dorm has a room for repairing items and Facebook groups to sell and swap them.

Source:
From the qualitative interview

Pumpipumpe (CH)

A sticker system: You place stickers on your mailbox so your neighbours can see what you can borrow from them

Source:
https://www.pumpipumpe.ch/order-stickers/

Remakery (UK)

Multi-functional work space focusing on reparing and re-using waste materials. Local businesses can rent a work space and private people can have membership to access the work space.

Source:
https://remakery.org/

Figure 20: Benchmarking

INPUTS FROM BENCHMARKING

Comparing existing concepts and initiatives according to the needed functionalities and components in the designed system structure helped to widen up the scope of possibilities and give new inputs and ideas for further development of the idea. Below the considerations are presented.

DIRECT USE
Except from dba.dk, all projects focusing on and working with direct use of resources do not include a revenue stream. The aim of these projects are therefore not driven by economic profit but to create opportunities for the resources to be directly reused as easily as possible.

DISTRIBUTION
All the projects that include a distribution service have a revenue stream in order to pay for the car expenses.

REPAIR
The projects that include repair services are reselling the fixed products online or in a physical store, since it has taken work hours and new materials to add value to the used products.

SHARE
How can the system structure integrate a sharing service? Are there any components or functionalities within the system structure that can be utilised better through a sharing service?

ONLINE CHANNELS
Existing online channels can function as a distribution channel.

FUTURE-STATE PRODUCT JOURNEY MAP

By combining the knowledge gathered from the RTD method and Benchmarking, it is now possible to merge the different insights, knowledge and ideas into an initial idea. The idea is an alternative big waste service system, which fulfills the required components and functionalities identified by the RTD.

A powerful tool to communicate and visualise the alternative system is journey mapping, which combines both storytelling and visualisation to make intangible experiences visible and create a common understanding of the idea (Kaplan, K. 2016; Samply. n.d.). While a current-state journey map creates an overview of existing services and identifies weak points, a future-state journey map focusses on creating new experiences or envisioning the future (Kaplan, K. 2016; Samply. n.d.).

In most cases, a journey map will focus on mapping a process that a potential customer goes through in order to achieve a goal, and is a representation of an experience of a customer over time (Kaplan, K. 2016). However, since the design challenge in this case study aims to design a solution for resources ending in the big waste room to be utilised to their full potential, the journey map communicates a product's journey in the future alternative system.

The benefits of communicating the idea through a future-state product journey map is that journey representation can take various scopes and scales. It can represent detailed step-by-step descriptions on a microscale, but it can also represent a wider scope by focusing on the beginning-to-end customer or product journey (Stickdorn, M. et al. 2018).

In terms of mapping out the product journey (and not the user journey), it has only been possible to find "Product Jouney Mapping" produced by IDEO and the Ellen MacArthur Foundation (Ellen MacArthur Foundation & IDEO. 2017). But when comparing the description of a product journey map with a customer journey map, both maps aim to illustrate a holistic view of an experience unfolding over time (Ellen MacArthur Foundation & IDEO. 2017).

EXTERNALISATION OF THE IDEA: GenSkab

The work title "GenSkab" was made to communicate the idea and refer to the concept. In English, this can be translated as "Recreate". A Danish title was chosen since MPA is working in a local Danish urban neighbourhood.

The future product journey map of GenSkab (see figure 21: Product journey map) is illustrated through a circular representation to emphasise how products are being reintegrated in the existing system over time. And by representing the alternative system through a high-level journey map, all possible channels can be identified, which provides a comprehensive overview (Stickdorn, M. et al. 2018).

GENSKAB PRODUCT JOURNEY MAP

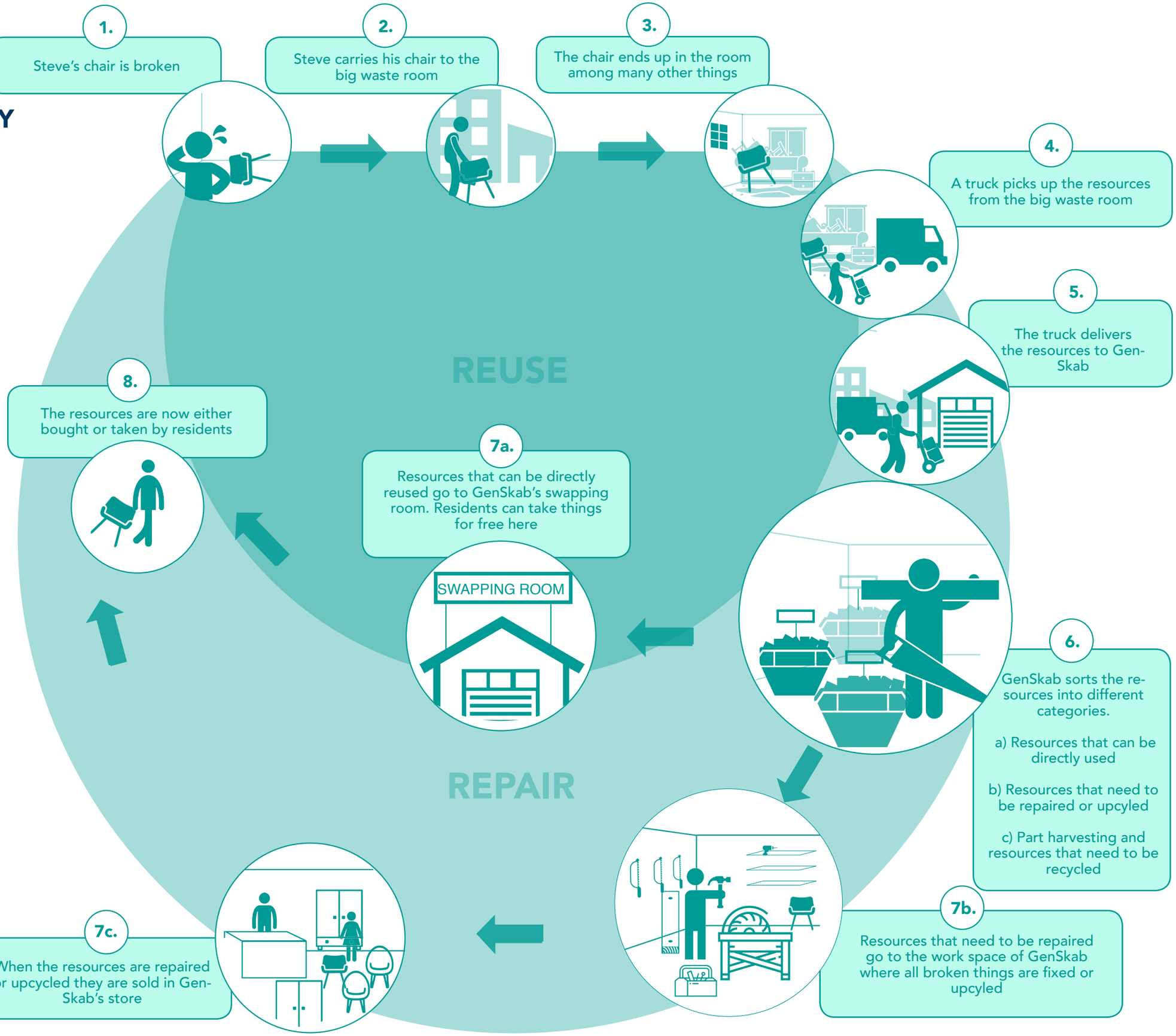


Figure 21: Product journey map

GENSKAB SYSTEM MAP

The illustration below gives a synchronic representation of the system behind GenSkab. The aim of visualising an idea through an abstract synchronic representation is to create a map that gives a systemic overview of the idea and highlights the required functionalities and components to maintain the underlying system (Diana, C. et al. 2009).

What is important to notice in this representation is that it highlights new aspects of the idea, such as the fact that there are possibilities for residents to use the work space as well as to rent tools from the work space.

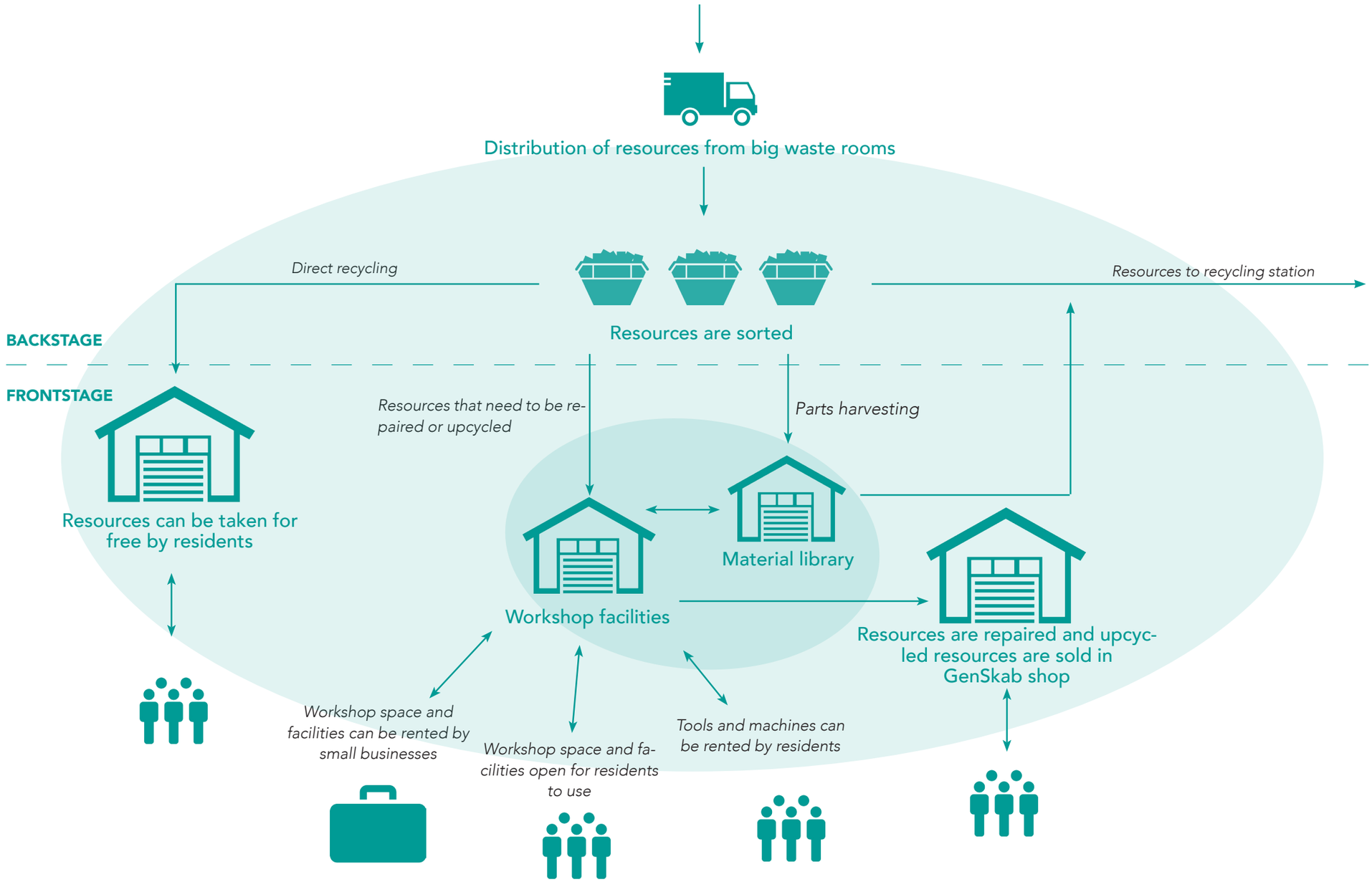


Figure 22: System map

EXPERIMENT

EXPERIMENT

According to the discipline of service design, an ideal solution should not only solve the problem statement but also be feasible and realistic from the perspective of the service provider (Mager & Sung, 2011). It was therefore essential to include Miljøpunkt Amager in the ideation process, to investigate if the initial idea would be realistic and feasible for them as project owner, as well as involve them in a creative approach to explore and develop the idea further.

In order to communicate, but also develop the idea, the most constructive way to include the team of MPA in the ideation process was to visualise the idea. Since the idea is a service system, prototyping the system was a way to communicate the idea as well as create a space for the team members of MPA to critique and develop it.

PROTOTYPING

At this point in the design process, the idea of GenSkab was still in an early stage of development and the intention of involving the MPA team was first to communicate the idea in order to investigate its potential and feasibility and, second, for the team to challenge and develop the idea.

According to Buxton, it is essential that the "*design is right, before developing the right design*" (Buxton, B. 2007). By this, Buxton emphasises the importance of designing the right structure or core function of the idea before focusing on detailing the solution's look and feel. In relation to the further development of the idea, it was therefore essential to include Miljøpunkt Amager in the ideation phase in order to investigate if the initial idea was realistic and feasible for MPA as project owner.

In order to make ideas solid and robust and to minimise failures before implimentation, prototyping is essential for exploring potential challenges and opportunities when designing future services and artefacts. Prototyping can be used to discover and develop ideas, express and communicate ideas, and evaluate ideas (Hartmann, B. 2016).

When approaching idea development through prototyping, the media or tools that are used to build the prototype are not always important. But what is essential is the designer's understanding of how to use prototyping to explore aspects of the future artefact (Houde & Hill, 1997). According to Houde and Hill, a prototype can externalise

three different aspect of a future artefact or service (Houde & Hill, 1997) (see figure 23: Prototype model).

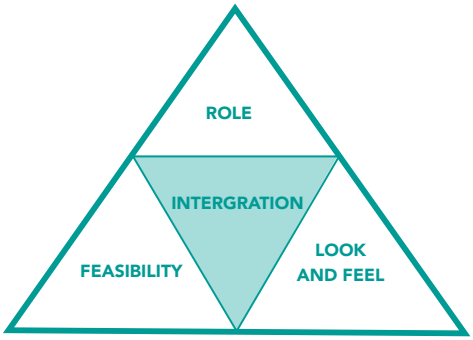


Figure 23: Prototype model

The prototype can express:

Value: Focusing on questioning the role that the artefact will play in the user's life

Look and feel: Focusing on questioning the specific sensory experience

Feasibility: Focusing on questioning the techniques and the components (Houde & Hill, 1997)

A prototype does not have to consider all aspects of the model, but as a designer it is important to keep in mind what aspect of the prototyped artefact you want to question. According to Stickdorn, value-prototypes are useful when expressing an idea, since it is easier to find suitable technologies or business models for an idea that has evolved from a solid value proposition, instead of the other way around (Stickdorn, M. et al. 2018).

DESKTOP WALK-THROUGH

The aim of prototyping the idea of GenSkab was to communicate the idea to the team of MPA as well as involve them in challenging and developing the idea. The look and feel of the prototype was therefore not considered during the prototyping session.

Since the initial service system of GenSkab consists of many components, the representation of the idea was done through a desktop walk-through which externalises the complexity of an idea. A desktop walk-through is a service design method where a miniature environment is built in order to construct knowledge about a specific service or system. It is an efficient method for imagining non-existent experiences (Blomkvist, J, et al. 2016).

The prototype was made of LEGO® and to foster a conversation and discussion of the prototype, the team of MPA was divided into three groups. One team was given the viewpoint of residents, one an expert of circular economy, and one as Miljøpunkt Amager. Through Post-It notes, each group had to identify opportunities, challenges, critical touchpoints, possibilities for collaborating partners, and other aspects of the service system.

The prototyping session was recorded and photographed during the service walk-through.

Picture 15: Service walk-through #1

Picture 16: Service walk-through #2

INSIGHTS

The service walkthrough turned out to be a useful method for externalising the service system of GenSkab in order to start a discussion of how the designed system of GenSkab can be a potential solution for solving the given problem area.

In general, the team of MPA was positive towards the concept of GenSkab and throughout the entire workshop there was active participation. There were many useful insights and discussions which were highly relevant for the further development of the solution. Below are the main insights and perspectives from the service walk-through.

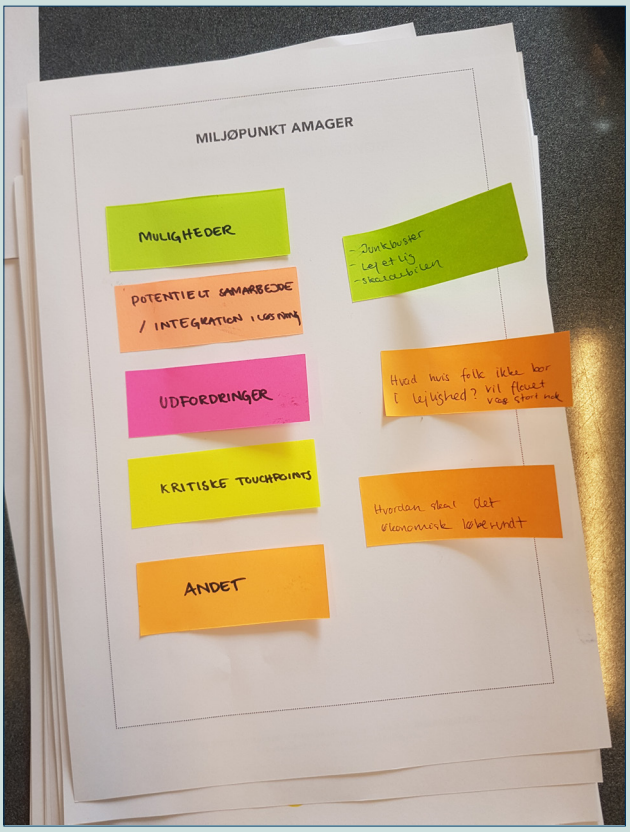
ECONOMY

One of the main concerns and problems discussed during the service walkthrough was how the system of GenSkab could create a sustainable economy.

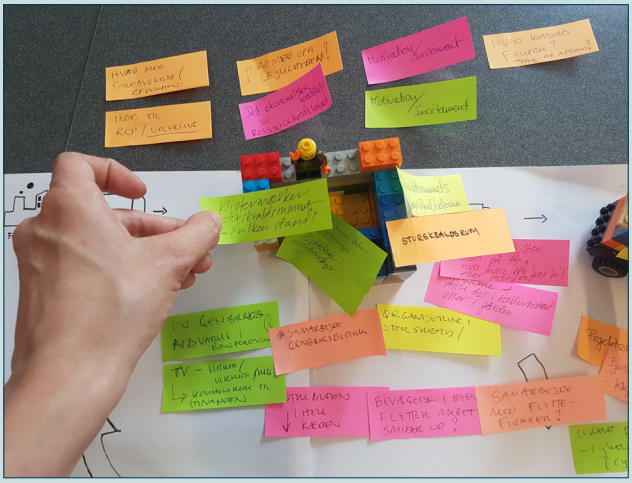
"*One thing is that it is a nice idea, but the other thing is that it needs to have an economic incentive before it is interesting for us*" (Claus Knudsen, MPA).

In the perspective of MPA, who are driven by public funding, the necessity for the solu-

Picture 17: Service walk-through #3



Picture 18: Service walk-through #4



Picture 19: Service walk-through #5

tion to be economically self-supporting is a crucial point for the long term success of the idea, since it cannot be run or dependent on MPA's funding alone.

Their recommendation for further development of the concept was therefore to identify where in the system of GenSkab there could be potential for a revenue stream and to identify how such a system could be economically sustainable.

LOGISTICS

Another critical point that was pointed out during the workshop was the logistics of collecting the resources from the big waste room.

In the current system, the private housing associations already pay the municipality to maintain the service of the big waste room and it was questioned why the housing associations would be interested in paying for an extra service if they are already paying the municipality.

"*It is both a challenge and a potential for the development of the idea, but it could be interesting if there could be designed a business model for the logistics of the big waste room. Could the revenue stream of reselling the products cover the expenses for maintaining the distribution and collection of the big waste, which could make the service free for the housing association?*" (Inge Hopes, MPA)

EXPERTS
The system of GenSkab is premised on a work space for repairing, fixing or upcycling the resources collected from the big waste room, which means there is a need for integrating skilled craftsmen/craftswomen, people who have knowledge about recycling, or a creative mind.

THE BIG WASTE ROOM
It was mentioned that the big waste room is a critical factor since the condition of the big waste rooms differ from housing association to housing association.

"*To be more specific towards the components of the idea, the accessibility and design of the big waste room has a huge impact on how people are dealing with the resources ending in the big waste room. If there is no light in the room, you maybe don't dare to go down there. Then you are throwing your chair in the room and it will break. Or maybe the room is damp? The design and shape of the big waste room has a huge impact for the quality of the resource. One thing is that the resources can have a certain quality when you leave it in the big waste room, another thing is that it can change its quality which will affect the entire circuit of the system*". (Claus Knudsen, MPA)

The team of MPA also questioned the robustness of the system, when the entire flow of resources and depended on the materials from the big waste room, since its a touchpoint combining many stakeholders with different interests.

NEW IDEAS
During the walk-through, new ideas and thoughts were also discussed. Some were specific to the service system of Genskab and others were very broad and not directly connected to the idea.

Can the problem of the big waste room be solved in another way?
One of the discussions focused on how distribution of resources from the big waste room could be done in a different way. A way in which there is a bigger focus on sharing the resources among residents and where there is no need for collecting resources.

- Facebook groups could potentially open up the closed big waste room for other audiences
- "Friendship" housing association, where residents from one housing association could enter the big waste room of another housing association
- One responsible waste service person for an entire street who would enable the housing associations to save money and at the same time give the service person the possibility to resell big waste

OTHER IDEAS
- Redesigning the big waste room so it encourages users to treat the resources better and the resources look more inviting
- Encourage people to upcycle
- Create a sticker system
- Foster motivation and create an incen-

tive, for instance by giving something in return when people hand in their resources

EVALUATING FEEDBACK

Involving the team in a service walk-through led to many valuable insights and new perspectives regarding the idea and contextual situation.

Some perspectives and ideas discussed during the walk-through were useful for further development of the service system of GenSkab, but other ideas and discussions quickly became too distant from the actual purpose of the workshop and were not constructive for the ideation process in terms of developing the service system further.

The most valuable insight for further development of the system was the discussion about identifying where in the service system a sustainable economy could be established. The discussion about the flow of resources also highlighted an important aspect, since the conversation pointed out a weak point in the system by relying on the big waste rooms as a single provider for the flow of resources. This is especially because the big waste room is a hub for many stakeholders and combines the meeting between the private and public.

As mentioned, some ideas and discussions were not very constructive, which is a result of how the workshop was facilitated. By facilitating the discussion and guiding the conversation more firmly, it would have made the team of MPA relate and reflect upon the service system of GenSkab through the lens of the 5 given categories that were provided at the beginning of the prototyping session (see picture 18). Firmer facilitation of the conversation might have produced specific outcomes and ideas for the service system, which could have contributed to developing the components and functionalities of the ideas further.

The discussions emerging from the prototype session were relevant in terms of developing parts of the system further and making the system more solid and feasible for being integrated in a local context, but not for changing or adding any new structures or components to the core of the service system.

DEVELOP

DEVELOPING THE IDEA

The insights and ideas generated from the service walk-through highlighted different aspects of the concept that needed to be further clarified or developed in order to create a solid and feasible solution.

This section will therefore focus on exploring and identifying the economic potential of the service system of GenSkab as well as how the concept can be feasible for implementation in a local context of Amager East. In order to do so, the required components and functionalities that constitute the service system of Genskab will be compared with existing functionalities, actors and stakeholders on Amager East, to identify if there are existing actors or relevant stakeholders, and whom, that can provide these functionalities.

INITIAL THOUGHTS ON DEVELOPING THE IDEA

First of all, it is essential to identify a business model that can be financially sustainable and furthermore the idea should be locally anchored and executed, which was clarified during the key-informant interview with Claus Knudsen during the discovering phase.

To implement a concept and solution such as GenSkab will change the existing environmental construction, which will affect the existing system and involved stakeholders. Since the solution of GenSkab cannot be executed by MPA alone, there is a need to involve others actors into the service system.

When designing in a systemic worldview, it is argued that "*creating innovation is seen as creating new value constellations in markets, by either transforming existing value constellations or creating new constellations*" and by understanding the service is unfolding in a service-ecosystem, it can enable researchers to broaden the scope of innovation by considering new interactions among actors and processes involved in a given value creation (Vargo et al. 2016).

This aspect makes it relevant to explore if there are existing stakeholders that could be integrated in the service system and thereby create new value constellations.

POINTING OUT THE SERVICE FUNCTIONALITIES

To map out existing local stakeholders that could have a stake towards the service system of GenSkab, as well as identify sustainable economic potential, a technical representation of the product journey was made.

The technical representation systematises and concretises the system's needed functionalities and components by identifying the needed functionalities within each step of the product journey, as well as identify where in the product journey there is potential for a revenue stream. Furthermore it identifies which stakeholders have a stake in the service system of GenSkab.

POINTING OUT THE SERVICE FUNCTIONALITIES

STEPS

Big waste room is full	Service person from the Housing Association contacts GenSkab	The resources are picked up from the big waste room	Resources are distributed to to GenSkab's location	At GenSkab the resources are sorted into different categories	There are now three different options to reintegrated resources

PRODUCT JOURNEY

STORYBOARD





A
Resources that can be directly reused

B
Resources that need to be repaired or upcycled

C
Parts harvesting and resources that need to be recycled

FUNCTIONS

	Big waste room is full	Service person from the Housing Association contacts GenSkab	The resources are picked up from the big waste room	Resources are distributed to to GenSkab's location	At GenSkab the resources are sorted into different categories	There are now three different options to reintegrated resources
WORKER			●	●	●	
LOGISTICS			●	●		
PHYSICAL PLACE				●	●	
COMMUNICATION		●				

REVENUE STREAM

	Big waste room is full	Service person from the Housing Association contacts GenSkab	The resources are picked up from the big waste room	Resources are distributed to to GenSkab's location	At GenSkab the resources are sorted into different categories	There are now three different options to reintegrated resources
+			• Potential for income			
−			• Workers' salaries • Expenses for van	• Workers' salaries • Rent	• Workers' salaries • Rent	

STAKEHOLDERS

Big waste room is full	Service person from the Housing Association contacts GenSkab	The resources are picked up from the big waste room	Resources are distributed to to GenSkab's location	At GenSkab the resources are sorted into different categories	There are now three different options to reintegrated resources
• Service person from the Housing associations • Municipality • Housing associations	• Service person from the housing associations • Municipality • Housing association • MPA	• Municipality • Current waste collectors • Other companies dealing with distribution (eg. Junk Buster, moving companies, Rent-a-car) • MPA	• Municipality • Amager Ressource Center • Current waste collectors • Recycling station • MPA • Voulenteers	• Municipality • Amager Ressource Center • Recycling station • MPA • Volunteers • Other companies	

A

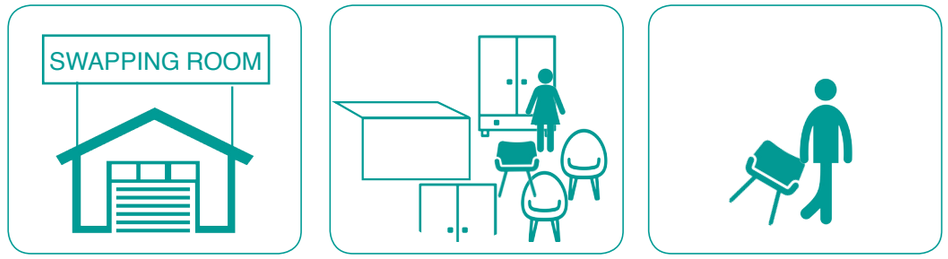
Resources that can be directly reused

STEPS

Resources that can be directly used go to the swapping room	At GenSkab's swapping-room residents pick up things for free	The resources are now integrated in a new circle

PRODUCT JOURNEY

STORYBOARD



FUNCTIONS

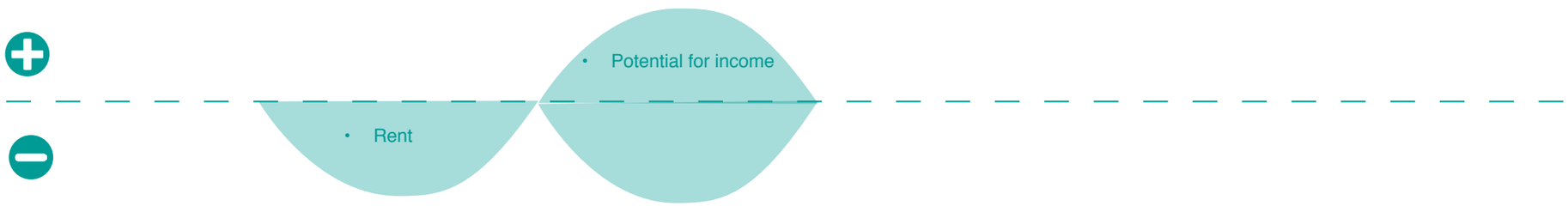
WORKER

LOGISTICS

PHYSICAL PLACE

COMMUNICATION

REVENUE STREAM



STAKEHOLDER

• Municipality • MPA • Residents of Amager • MPA • Existing charity shops	• Municipality • MPA • Residents of Amager • Existing charity shops • Amager Ressource Center	• Municipality • MPA • Residents of Amager • Existing charity shops • Amager Ressource Center

B

Resources that can be repaired or upcycled

STEPS

Resources that need to be repaired or recycled go to the workshop	The resouces are repaired	Repaired products go to the shop	Resources are sold and reintegrated in a new context

PRODUCT JOURNEY

STORYBOARD

FUNCTIONS

- WORKER
- LOGISTICS
- PHYSICAL PLACE
- COMMUNICATION

REVENUE STREAM

	Revenue through renting the facilities to residents and businesses - both tools and work spaces	Revenue through sale of products
Payment of rent Payment of worker	Payment of rent Payment of worker	Payment of worker Expenses for van

STAKEHOLDER

Small businesses MPA Residents of Amager Municipality	Small businesses MPA Residents of Amager Municipality	Charity shops Residents of Amager Municipality MPA Small businesses	Residents of Amager Municipality Amager Ressouce Center MPA Small businesses

C

Parts harvesting or resources that need to be recycled

STEPS

1 Resources where parts can be reused are go to the material library

The material library can be used by the workers in the workspace

The parts are reintegrated as something new in the workspace

Repaired products are sold in the shop

Products are reintegrated in a new context

2 Resources that can not be reused are distributed to the recycling station

Resources are processed at the recycling station

PRODUCT JOURNEY

STORYBOARD

FUNCTIONS

WORKER

LOGISTICS

PHYSICAL PLACE

COMMUNICATION

REVENUE STREAM

- Payment of rent
- Payment of worker

- Payment of rent
- Payment of worker

- Payment of rent
- Payment of worker

- Revenue through the sale of products
- Payment of rent
- Payment of worker

STAKEHOLDER

- Municipality
- Amager Ressource Center
- MPA
- Local residents
- Small businesses

- Recycling station
- Amager Ressource Center
- MPA
- Small businesses
- Distribution companies

- Recycling station
- Amager Ressource Center
- MPA
- Small businesses

- Recycling station
- Amager Ressource Center
- MPA
- Small businesses
- Local residents

- Recycling station
- Amager Ressource Center
- MPA
- Small businesses
- Local residents

ACTORS MAP

The technical representation enabled the systematisation of the needed functionalities and components of GenSkab along with stakeholders that could have a stake in each of the different touchpoints of the service system.

Having identified the needed functions and components, it now became possible to compare the system's needed functionalities, components and actors with the local context, to explore if there were actors in context of Amager East able to maintain the identified functionalities.

Below an actors map provides an overview of potential actors. In the centre of the map is GenSkab and the map represents which actors are capable of maintaining the solution's needed functionalities (Stickdorn, M. et al. 2010).

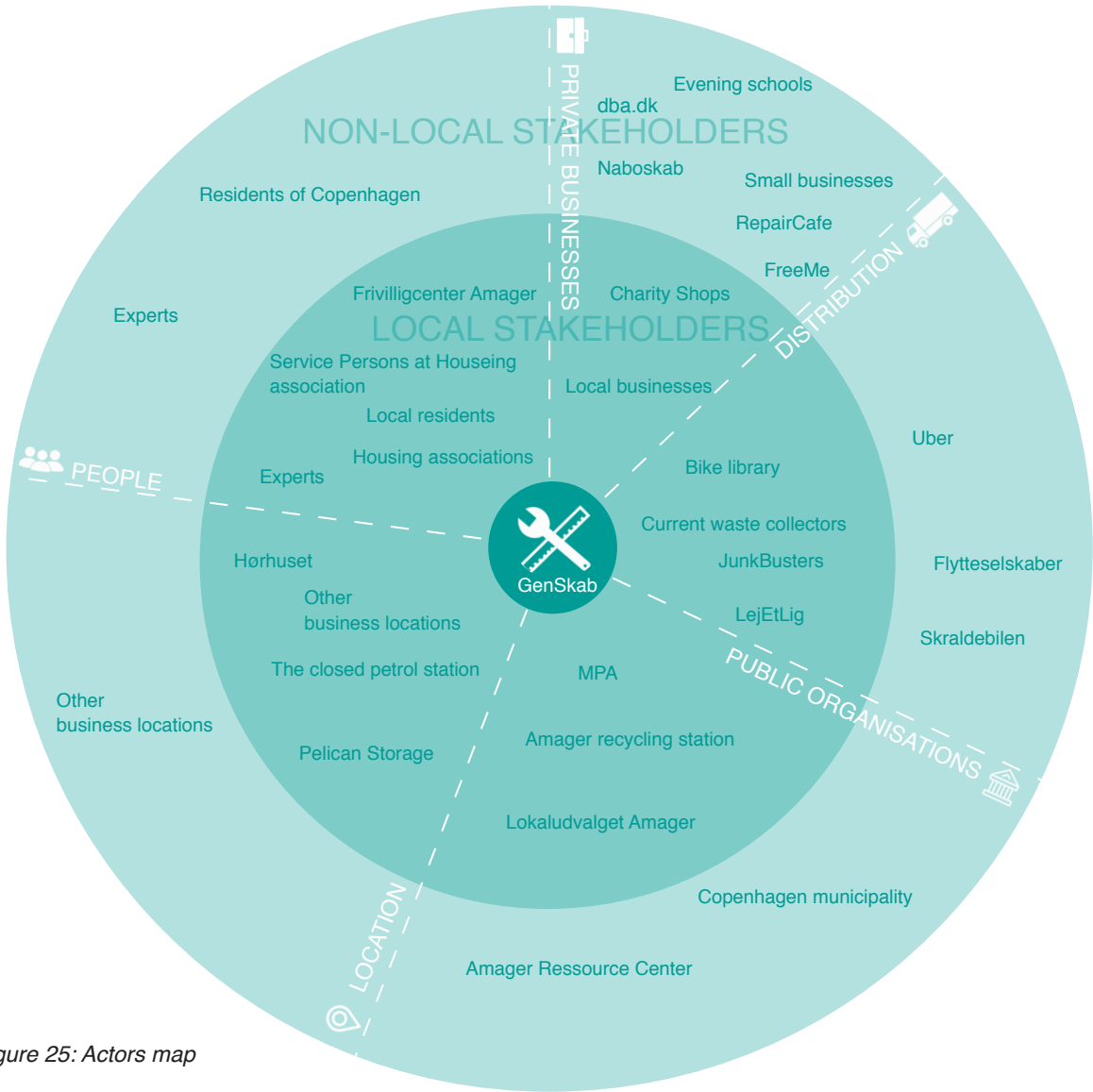


Figure 25: Actors map

STAKEHOLDERS

By establishing GenSkab as an alternative system, the service solution will interfere with the current ecosystem, which will affect current stakeholders and the existing value constellation.

Since some of the stakeholders within the ecosystem of the big waste collection are influential, it was necessary to categorise existing stakeholders to identify which local actors are essential for integrating the solution and if any might be against the proposed solution.

To help categorise stakeholders, Milosevic's Stakeholder Influence Grid was used. The matrix divides stakeholders into the axes of 1) power, and 2) importance, for inclusion of the stakeholder in the project (Martinelli, J. E. et al. 2003, p. 77).

The area "fully onboard" on the stakeholder matrix is where the essential stakeholders for implementation of the solution are placed. Furthermore, the stakeholders placed in "Leaders" are ones with power and influence within the current ecosystem and are important to consider when wanting to implement the system

STAKEHOLDER MAP

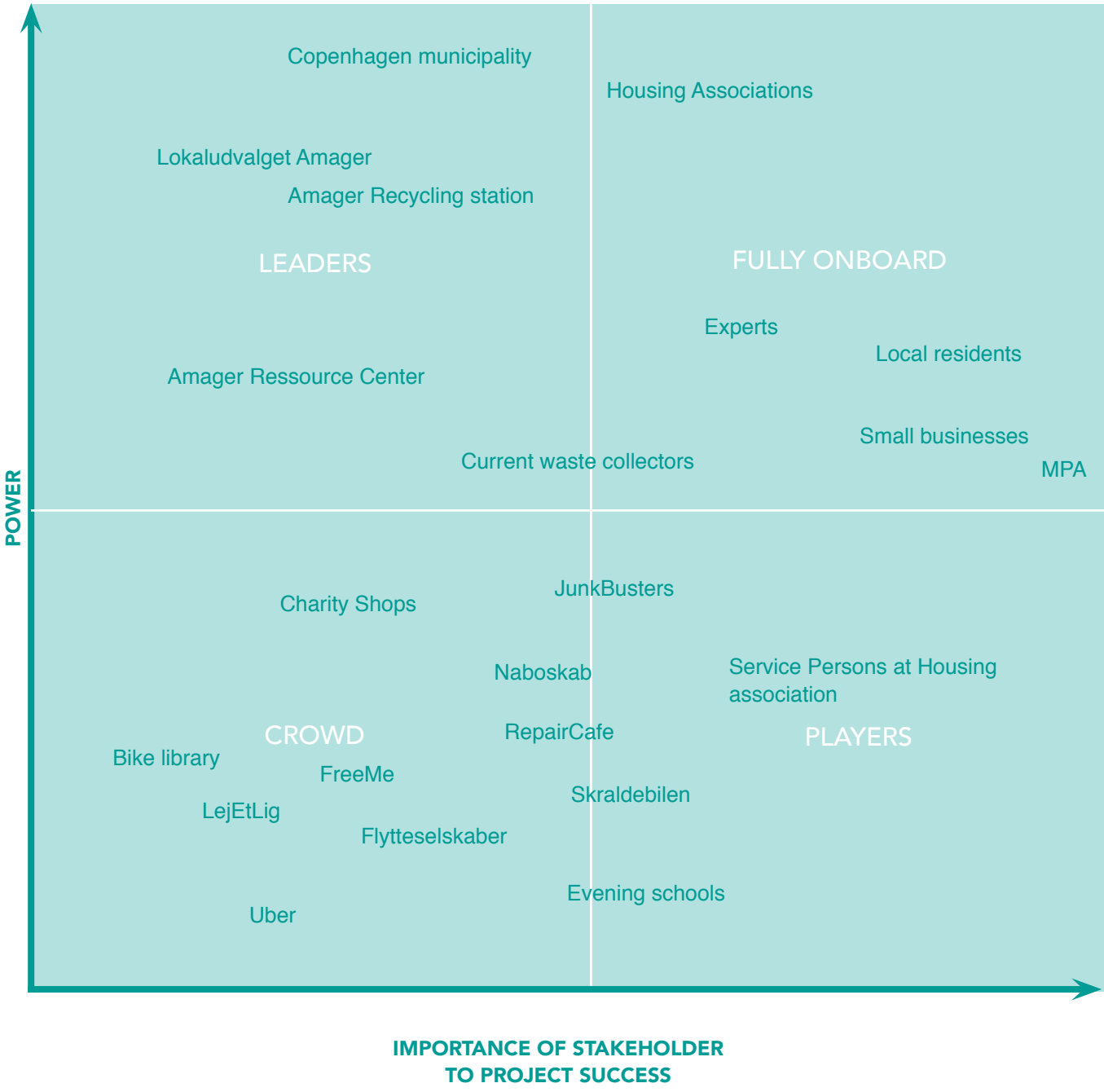


Figure 26: Stakeholder map

MOTIVATION MATRIX

As reflected in the stakeholder matrix, some stakeholders are essential for the implementation of the service system of GenSkab, while others may be important to consider integrating in the service system because they have power and influence in the value constellation of the current ecosystem.

The powerful stakeholders are important to consider when creating a strategy for partnerships or a network, since their interest in, or disinterest towards, the solution can be essential for the success of the project. By the use of a motivation matrix, potential connections and value constellations between different actors taking part in a project can be clarified and at the same time create an overview of their motivation for taking part in the solution (Jégou, F. et al. 2005).

The essential actors for executing GenSkab identified in the stakeholder matrix are in green in the motivation matrix. Furthermore, the motivation matrix includes and evaluates the motivation of powerful stakeholders. These stakeholders are represented in yellow in the motivation matrix. The powerful stakeholders are not essential for the implementation of the solution but can play an important role for the success of the solution, and it is therefore relevant to understand their motivation or disinterest in being part of such a solution.

By going from the upper left corner towards the lower right corner, the motivation matrix describes each stakeholder's relationship to each other when taking part in the GenSkab solution. The diagonal line shows the different actors' motivation for participating in the solution.

MOTIVATION MATRIX

Brings to →	Housing Association	Current big waste collectors	Municipality	ARC	Recycling station	Local residents	Small businesses	MPA	Expert	GenSkab
Housing Association	.To get a cheaper big waste service	.In direct money for maintaing the big waste service	.Money for maintaing the waste services	.In-direct money for maintaing the big waste services	.A recipient service where resources can get recycled	.An option to make resources accessible to residents	.Make resources accesible for businesses	.Key partner in resources accessible for business		.Key partners in providing the flow of resources
Current big waste collectors	.Excecuting the distribution service of collecting big waste	.To maintain their current position	.Excecuting the distribution service of collecting big waste	.Excecuting the distribution service of collecting big waste	.Excecuting the distribution service of collecting big waste	.Distributing the resources without destroying the value			.Distributing the resources without destroying the value	.Knowledge, components and infrastructure to distribute the resources
Municipality	.Offers a big waste service for private housing associations	.Money for maintaining the big waste services	.To make circular economy practical .To reduces expenses on maintaining waste services	.Money for maintaing the big waste services	.Money for maintaing the recycling of the big waste services	.An option to make resources accessible to residents	.New business possibilities	.Financial support for mantaing a circular solution	.Potential job	.Knowledge, money, network and infrastructure
ARC	.A way to enhance a more sustianable way of dealing with big waste	.Money for maintaining the big waste services	.Executing the most sustianable way of recycling resources	.To make circular economy practical .To reduce expenses on maintaining waste services	.Money / knowledge for maintaing the recycling of the big waste services	.An option to make resources accessible to residents	.New business possibilities	.Financial support for mantaing a circular solution	.Potential job	.Knowledge, money, contacts and infrastructure
Recycling station	.A service where resources can get recycled	.A recipent service where resources can get recycled	.Providing a more sustianable way of recycling with resources	.Less expenses on distributing recycling materials	.To reduces expenses on exportning recyclable materials .Reaching their goals of 20% direct reuse	.An option to make resources accessible to residents	.New business possibilities	.Financial support for mantaing a circular solution	.Potential job	.Knowledge and infrastructure
Local residents	.A way to make resources more available to residents	.In-direct money for maintaing the big waste service	.Money for maintaing the big waste service	.In-direct money for maintaing the big waste service	.In-direct money for maintaing the big waste service	.To have a space for learning, fixing stuff and renting tools.	.New customer and revenue stream	.Volunteering and evidence for maintaing the solution	.Costumer or enchounters to help fixing their stuff	.Revenue for renting the work space, participating in workshop, renting tools
Small businesses			.Executers of reparing and reintegrating resources in new contexts	.Executers of reparing and reintegrating resources in new contexts		.Knowledge, skills and expertise in reparing products	.To reduces expenses on rent, materials and tools		.Costumer or enchounters to help fixing their stuff	.Revenue for renting the work space
MPA	.A way to enhance a more sustianable way of dealing with big waste	.A partnership that allows a more sustianable way of dealing with big waste	.A joint partnership in a more sustainable big waste solution .Facilitator and projectleader	.A joint partnership in a more sustainable big waste service .Facilitator and projectleader	.A joint partnership in a project that are establishing a more sustainable big waste serivice	.Making it possible to maintain shared local workspace	.New business possibilities	.To make circulare economy practical in a local context	.Maintaing the work space and all practicalities	Project leader and responsible for maintaing and establishing the project
Expert			.Executers of reparing and reintegrating resources in new contexts	.Executers of reparing and reintegrating resources in new contexts		.Knowledge, skills and expertise in reparing products	.Knowledge, skills and expertise in reparing products		.Practices and money	.Knowledge, skills and expertise in reparing products
GenSkab	.A solution that enhances a more sustianable way of dealing with big waste	.A sustainable recipient service	.Fulfill the politicians intention of CE .New knowledge	.A partnership that can fulfill internal goals	.A partnership that can fulfill their internal goal	.A shared open local workspace, possibility to rent	.New business possibilities through shared work space and materials	.Make Circular Economy practical and locally achored	.A workplace to practice a hobby or potential job offer	.To prevent resources from being destroyed .To re-integrate resources in the society as easy as possible

Figure 27: Motivation matrix

PARTNERSHIP CONSTELLATION

Based on the motivation matrix, two constellations of partnerships are suggested as being suitable for executing and implementing the service system of GenSkab.

Considering MPA as the project owner of GenSkab in both constellations, each of the suggested constellations has its advantages and disadvantages, which will be elaborated in the following pages.

Constellation 1
PUBLIC

Establishing a partnership constellation with public stakeholders such as Copenhagen municipality, recycling stations and ARC, that were identified as the "leaders" in the stakeholder matrix, GenSkab has the potential to be founded as a pilot project, aiming to test an alternative big waste service on a small scale. Furthermore, the solution has the potential for functioning as a future test lab for testing new ideas and solutions within the recycling system.

Figure 28: Partnership constellation #1

Constellation 2
INDEPENDENT

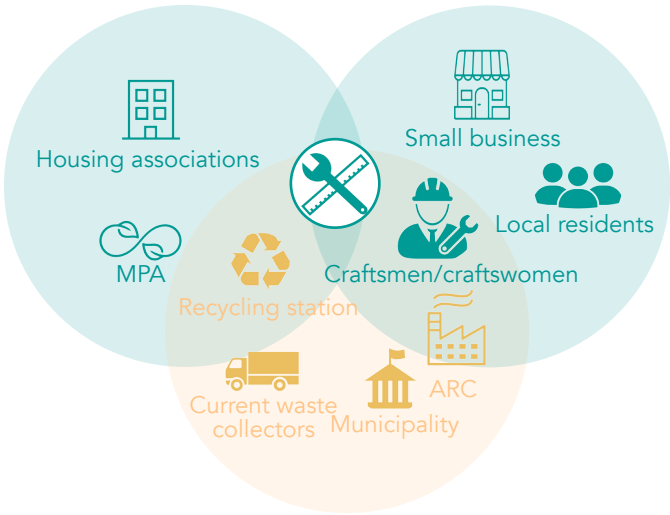
The system of GenSkab has the potential for being implemented as an independent alternative big waste system without involving the public institutions that currently are maintaining the waste ecosystem. By implementing GenSkab as a local independent system, it will be challenging the current public big waste system as a critical response and thereby be able to create awareness towards the topic of recycling and circular economy.

Figure 29: Partnership constellation #2

Constellation 1

PUBLIC

Collaborators: Copenhagen municipality, ARC, current big waste collectors, recycling stations, MPA, craftsman/craftswomen, local residents, housing associations, small businesses.



ADVANTAGES

Can take advantage of existing infrastructure

Includes distribution service

Available funding

Can be scaled to other parts of Copenhagen and potentially other cities

Involves stakeholders with power and influence

Contact and arrangement with housing associations are already establised

DISADVANTAGES

Will be more time consuming to establish

Involvement of public insitutions can complicate the process

MPA: loss of power and influence

Laws and constraints can be a barrier and the cause of compromise

CHALLENGES

Influential stakeholders might not be interested in being involved in the project

Influential stakeholders might not be allowed to be involved in the project

Law and constraints of public institutions may prevent the project

Constellation 2

INDEPENDENT

Collaborators: MPA, small businesses, crafts-men/craftswomen, local residents, housing as-sociations

ADVANTAGES

Full ownership

Easier to manage

No compromises in terms of partnership disagreements

Easier to establish since it does not need to involve many rigid stakeholders

No public ownership

DISADVANTAGES

No infrastructure

No distribution service

No agreements with housing as-sociations

Will compete with current waste collectors

Dependent on funding for estab-lishing the project

CHALLENGES

Establishment of an entire new infrastructure

If influencial stakeholders are againt the project

CASE CONCLUSION

CASE CONCLUSION

Ideally, an entire service design process includes implementation of the designed solution, followed by continuous iterations. Considering the complexity of implementing GenSkab in relation to the limitations of a set thesis period, executing and testing the idea of GenSkab in real settings was not an option.

What will happen further with the idea of Genskab is therefore uncertain due to different external and organisational reasons, which will be discussed in the following chapter.

Nevertheless, even if the suggested solution may never become a reality, the insights, discussions and conversations among the team of MPA as a result of the applied method of the design process, can support MPA in positioning their role and capabilities within the work of circular economy, which is a valuable contribution to MPA's further work on the Green Loop Project.

The insights of this case study will be gathered into an insight report, aiming to highlight the important findings from the case study as a contribution to MPA's further work in transitioning Amager East towards a circular economy.

Studying the topic of circular economy has been a wide and complex area of research because it exists in different parts of a value chain and different levels of sustainability. Balancing the complexity of the topic between the official master thesis objectives, while striving to meet the stake and interest of MPA has therefore had its limitations and challenges throughout the design process as well as towards the outcome of a designed solution which will be elaborated in the reflections.

DISCUSSION & REFLECTIONS

DISCUSSION

This section is divided into two parts which together will reflect upon different aspects of the case study and how the approach has been able to answer the given research question.

The first part is connected to the overall theoretical approach, discussing how the knowledge and learning generated from the case study contributes to answering the research question of how the methodological approach of service system design might support the transition towards a circular economy in local urban areas.

The other set of reflections will be connected more specifically to the methodology and will reflect and evaluate the choice of thesis partner and how the collaboration has influenced the design process due to the inherent limitations such collaboration produces. Furthermore, the section will move towards a more practical level by reflecting on the chosen methods and techniques, the challenges met when working with them, and how the entire process contributed to achieving both the study and personal objectives.

Direct and indirect impact

In the past years, there has been a growing awareness of the paradigm of circular economy in Denmark. The Danish government are establishing circular advisory boards; the incinerator, Amager Ressource Center, is creating workshops gathering creative minds to re-think their approach according to circular economy principles; and organisations such as MPA are taking up the challenge, trying to influence the transition towards a circular economy.

These examples indicate that there is the will and ambition to take action in changing to a circular economy, and that circular economy has established itself as a paradigm that can secure a more sustainable future. Now that it has become established, we can begin to move towards the next phase: how to move from the theoretical level to identifying and implementing circular solutions.

Identifying concrete initiatives that can transition a business or local urban neighborhood towards a circular economy has throughout this study been a complex challenge. Complex because circular economy initiatives can be achieved in different parts of a company's value chain, can be adapted in both product and system design, and at different levels of sustainability (Ellen MacArthur Foundation, 2018).

Furthermore, the transition can happen in nearly any industry and with any resource in a company's production process, as an independent innovative new solution or as

co-creation among companies, organisations and communities. Transitioning towards a circular economy is therefore highly dependent on the contextual situation of the actor wanting to create change.

Taking a closer look at actors “responsible” for creating the change towards a CE, they can be separated into two categories. The first category can be classified as the primary actors that have a production process or somehow deal with physical resources. This can be organisations such as Amager Ressource Center, a shop, or any production company. These actors can transition towards a CE only by focussing on their own core business, which creates a well-defined space for identifying opportunities for circular solutions.

The other group can be classified as secondary actors. These are actors that are not dealing with any physical resources or production processes, but have a stake and interest in influencing the transition towards a circular economy. This includes organisations such as MPA, BLOXHUB or municipalities.

This case study focusses on an actor belonging to the second category. This creates a more complex design space because these actors can work on the transition towards a circular economy by either influencing and encouraging the primary actors to take action, or establishing and implementing innovative new solutions themselves. Not all actors belonging to the second category have the capability to implement projects that will create direct impact and therefore have to contribute indirectly to the transition towards a CE. In the context of MPA, however, they are able to work in Amager East through an indirect or direct approach, by encouraging existing local actors to transition towards a CE, or by establishing new solutions themselves.

The design process in this case study aimed to create direct impact by introducing the solution of GenSkab. But to identify actual opportunities and gaps for creating new solutions is the real challenge, since there is no given direction for where to begin the transformation.

IDEO and The Ellen MacArthur Foundation have developed “The Circular Design Guide” which offers practical methods and exercises for how to identify circular opportunities. Since the methods focus on an internal analysis of a product or production process, The Circular Design Guide was not useful in the context of MPA, because their starting point for circular transformation was based on external factors. It could therefore have been interesting to further investigate how actors belonging to the second group can identify opportunities for circular design based on external factors.

A changing focus

During the research I realised that the focus of the design process changes to a certain degree when designing for a circular economy compared with designing for ser-

vices. The goal of a practical service design process is to support users in achieving a specific objective in the most optimal way by adjusting or creating a service system that fits the purpose. Mapping a user's journey interacting with a given service is conducted, therefore, to investigate where there is potential for optimising the service system in relation to the user. In this case study, journey mapping was done to map the journey of a product. Even though the user's behaviour was still considered during the design process, the product's life cycle, and how the infrastructure of the ecosystem influenced the product's lifecycle, was the centre of the design process.

The change in focus raises an interesting question about how designing for a circular economy and a human-centred design approach complement each other, since it can be argued that the object of the design process is changing and the designer now has to consider the service systems of a product's life cycle, while at the same time trying to meet a strategic fit between the user and the service provider.

Complex design spaces

Moving from the theoretical level of CE to identify opportunities in complex design spaces and translate these opportunities into tangible and implementable ideas was a challenge throughout this case study. Identifying opportunities in complex design spaces to then create implementable solutions is what makes service system design an interesting approach for supporting a transition towards a circular economy in urban areas. The case study showed that the applied methods and techniques embraced by the methodological approach of service system design can manage to identify opportunities in existing contexts and, furthermore, translate them into tangible design solutions.

The study showed that designing for a circular economy is highly dependent and influenced by the contextual situation, therefore a single case study can not contribute to a larger general understanding of knowledge towards the research area. However, the findings from the case study exemplify how the practical approach of service design supports a certain type of actor in navigating these complex ecosystems, by identifying opportunities and gathering valuable insights for a potential design solution.

To answer the research question, the case study shows a practical example of how the methodological approach of service system design manages to contribute with suggestions for how an actor can work in transitioning towards a circular economy in a local urban area by designing concrete initiatives.

REFLECTIONS

A design process is a bumpy road where design directions are unfolding along with gathered insights and learning. The design process carried out in this thesis has been far from ideal, which makes it great material for reflecting on the process and my role as a practitioner, and from which I can learn and develop as a service designer.

1. THE COLLABORATION

1.0 Limitations due to choice of collaboration

The area of research explored throughout this thesis emerged because of the choice of collaborating with MPA in their project Green Loop City. Therefore, the study has from the very beginning been examining the area of CE from the perspective of MPA, in their context, and through their capabilities and possibilities as transformers towards a circular economy. The choice of collaboration has therefore influenced the boundaries of the research space which has affected the overall outcome of the design process as well as the contribution to the given research question.

From a practical perspective, some might argue that it is being able to design within a given context, with its inherent boundaries and limitations to the design space, that is the art of a service designer. As well as to design solutions that are valuable for both user and service provider (Mager & Sun, 2011). This certainly is the reality for the majority of service designers when working for a company. But from a research perspective, it would have been interesting to have approached this case study and the given research question from another starting point. A starting point founded on how service design can contribute towards transformation towards circular economy in local urban areas without being linked to a specific partner from the beginning of the process. This would have allowed a research space that was not influenced by MPA and their contextual situation and thereby created the foundation for another process and outcome, which might have contributed to a more general understanding of designing for a circular economy.

1.1 The collaboration and my role as a designer

A human-centred design process is an expert-driven process which in many cases is led by a designer or a design team who are responsible for taking the final decisions about each component of the designed service (Goldstein, S. M. et al, 2002). When balancing between creating solutions that are valuable, not only for users but also for service providers, a great responsibility is therefore taken on by the designer and her ability to make decisions that are founded on a good understanding for mediating between actors and service provider (ibid.).

In relation to what I have mentioned above, it is therefore important to consider how the collaboration with MPA has been carried out through this case study, to understand how my role as designer and decision-maker has influenced the design process and the

designed solution. But also to critically reflect on the collaboration as a learning process from which I can develop, since the collaboration with MPA has not always been ideal.

During the research I was physically placed at the office of MPA which created an opportunity to access the team easily. But despite my physical appearance, I was mainly working alone on the project and thereby the main driver for shaping the direction of the design process. As a designer leading a human-centred design process, I wanted to involve the team of MPA in the process in order to create a useful and desirable outcome for the organisation by creating a feeling of engagement and ownership towards the designed initiatives. Unfortunately, the circumstances for fruitful collaboration was not always optimal.

At the beginning of the case study I had regular meetings with the managing director of MPA but in addition to this, there was no further interest for engaging in the process. Since the Green Loop City project and circular economy is a focal point for MPA and also will be for the coming years, I had hoped for the collaboration to be a shared project in which MPA had a greater interest in creating a closer collaboration in order to develop something valuable together. When I look back at the process, I can see that this expectation did not materialise. Upon reflection, I think I should also have taken more responsibility to include the MPA team in the design process instead of expecting them to take initiative.

This involvement could have been through regular team meetings, brainstorming sessions or discussions. By doing so, the team would have had a bigger influence on the direction of the design process which could have created a feeling of ownership and purpose for investing time and energy in the project and, in the end, have created an outcome in which there was a greater impetus to implement in the future.

In terms of MPA's investment, interest and engagement in the design process it is worth mentioning that this was not my responsibility alone, but could have been influenced by the fact that the managing director, Claus Knudsen, who was the main link between my case study and the rest of the MPA team, announced in June that he had a new job. Since the Green Loop City project and designed solution of GenSkab require an extended period for implementation and impact, it could have played a role in his engagement and interest, since he knew that he would not be responsible for the project in a few months' time.

1.2 The impact of the design process

Looking at the outcome of this case study, the designed solution of GenSkab is still at a conceptual level which has not yet been implemented or created an impact in Amager East. Furthermore, actual implementation of the idea is uncertain due to a change of management and its complexity.

Nevertheless, it can be argued that the

design process has contributed to the overall project of Green Loop City through knowledge sharing. For instance, the service walk-through began with a Power-Point presentation where the team of MPA was introduced to the findings emerging from the design process. The presentation received a lot of positive comments and the ecosystem map of the recycled product was requested as a tool for their further work. Furthermore, the discussions that emerged from the service walk-through were interesting and created awareness and ideas among the team about the given problem area.

An insight report will be given to the MPA team, in which they will have access to the findings and knowledge generated from the design process, which they can use in the future work with the Green Loop City project.

2. CONSIDERATIONS ABOUT CHOSEN METHODS AND TECHNIQUES

The following and last section will focus on the practical level, reflecting upon the applied methods and techniques and the different challenges that I, as the designer, faced during the design process.

2.0 Designing without a team

One of the major challenges I faced throughout the entire design process, but became especially problematic during the ideation phase, was the fact of designing without a team who shared the same working approach and with whom I had a common foundation of knowledge.

The reason why designing alone was particularly challenging during the ideation phase, was because there was no one to challenge, encourage or develop the generated ideas on a basis of a common understanding of the given design space.

As mentioned in the case study, brainstorming is often used as an approach to kickstart the idea generation process, by focusing on generating as many ideas as possible. Including the team of MPA in a brainstorming session would no doubt have produced suitable suggestions which could have been used for further development of an idea. But because of the complexity of the design space and due to practicalities, it was only possible to gather the team of MPA if it was scheduled weeks in advance. Accessing the knowledge and creativity of the team was therefore limited and I had to take full advantage of the scheduled meetings. Because of this, I decided that the most useful way of including the team in the ideation phase was through a workshop in which they had to engage the concrete idea of GenSkab.

Another approach to challenge my ideas and bring new perspectives to the design process, would be to reach out to experts working and researching within the field of designing for a circular economy. Experts would have challenged my ideas in ways that were not related to the context of MPA, but could also have provided a broader perspective and different considerations to

the design process. Experts such as Emmy Laura Perez Fjalland (Lecturer at Roskilde University who specialises in urban development, the sharing economy and food systems), Karine Blandel (expert and consultant in circular economy) and Anna Seravalli (Lecturer at Malmø University and responsible for the Co-Lab for Circular Economy and Reuse) were all approached during the exploration and ideation phase. Although I was in contact with all these experts, unfortunately my several attempts did not succeed in producing an interview.

When looking back at the ideation phase and the design process in general, involving stakeholders in the process might have been even more necessary when designing alone in order to involve someone to challenge ideas and contribute with new perspectives towards the design process.

Based on the above mentioned, one of the most important lessons for accomplishing an entire design process on my own is therefore not to underestimate how much preparation a well-structured design process demands. Thinking ahead of the process, keeping deadlines, contacting stakeholders, developing and creating material for the different methods, executing the different methods and at the same time writing and reflecting upon the gathered insights in order to move the design process further and including time for iterations, are just some of the parameters that have to be considered when trying to schedule a process plan.

My ambitions and ideas have been limited by my capabilities as a single researcher during this design process which has sometimes had been difficult to accept. But being involved and responsible in every step of the design process has given me a solid understanding of the topic and applied methods.

2.1 The service walk-through

The discussion arising from the service walk-through provided some valuable elements for the further development of the idea of Genskab. However, no major component of the core idea was changed. When looking back at the ideation phase and how it was approached for developing ideas, it is my belief that the team of MPA was included too late in the ideation process due to a number of reasons:

Iterations

During the design process, I argued against the involvement of the team of MPA early in the ideation phase. However, entering the service walk-through with a more or less complete idea, I might have been less open towards changing components of the designed solution. Time constraints also influenced the decision about changing elements of the idea or changing the direction of the designed solution.

Ideally, the entire design process should have included more iterations. But especially during the ideation phase, I should have included the team of MPA from the very beginning, first of all to challenge my own ideas

as well as to create ownership towards the designed solution.

Ownership
When wanting to create ownership among the team of MPA towards the design solution, including them in a service walk-through to evaluate the already established solution of GenSkab might have been problematic. Since the team was not involved in the process of developing the idea, it did not create the conditions for establishing ownership.

2.3 Failed methods
Several methods and techniques that did not succeed or provide valuable insights towards the design process were tried out. For instance, through mobile ethnographic field research, I documented all companies working with recycling, repairing or sharing economy in Amager East, which were then clustered in relation to the model of the circular economy. This was done in order to investigate if the approach could help me identify opportunities for design directions. However, this method quickly turned out to be quite complex and did not provide any valuable contributions to the research area.

Moreover, after doing the qualitative interviews I spent time developing personas, to only then realise that the method was not relevant for developing a product journey map. Furthermore, the qualitative interviews were in the beginning thought of as a quantitative approach, but during the interviews I realised that boundaries framing the answers were not kept by respondents and I therefore had to rethink the interview before executing them.

The reason why I am highlighting these failed methods is because they were useful in giving directions towards the design process. If I had been a part of a design team, conversations among the team members might have led to such realisation without needing to spend time implementing these methods. However, trying out the methods did lead to new realisations from reflecting on why they did not work and why I needed to move in another direction.

CONCLUSION

CONCLUSION

This thesis has explored how the methodological approach of service system design can support the transition towards a circular economy in local urban areas.

To answer the given research question, the study was approached through a case study which allowed a practical design approach, in which applied service design methods were explored in relation to their capability and suitability in supporting a transformation process towards a circular economy. The case was provided by the organisation Miljøpunkt Amager and their project “Green Loop City”.

Through the project of “Green Loop City”, Miljøpunkt Amager wants to investigate how the organisation in the coming years can implement concrete initiatives that can transition the urban area Amager East towards a circular economy.

The case study was a human-centred design process examining the capabilities of Miljøpunkt Amager as a central actor in the transformation, as well as identifying circular opportunities within the context of Amager East where Miljøpunkt Amager can contribute to the transition. Furthermore, the design process aimed to design an tangible solution for the identified problem area. Due to the time constraints of the thesis, it was not possible to implement the designed solution which means the ideal design process is incomplete.

The result of the practical case study showed that identifying opportunities for MPA to transform the area of Amager East towards a circular economy is complex. Circular economy can be executed at many different levels of sustainability, in different parts of a value-chain, for different resources, and at the same time depends on actors’ capabilities and core business.

Based on the case study, it is therefore concluded that transitioning towards the circular economy in urban areas is complex and is highly dependent and influenced by the context which makes circular solutions difficult to replicate from one to another context.

The findings from the case study do not provide groundbreaking insights for the research area, but rather examine how the practical approach of service design can support a certain type of organisation in navigating complex ecosystems by identifying opportunities and providing meaningful insights that are valuable for a potential design solution.

To answer the given research question, the case study is, therefore, showing an example of how the methodological approach of service system design manages to support the transition towards a circular economy in a local urban area by designing a concrete initiative. But since this study has been approached through a single-case study and designing for a circular economy is complex and highly dependent and influenced by the contextual situation, it makes it difficult to contribute to a general understanding of the research question.

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