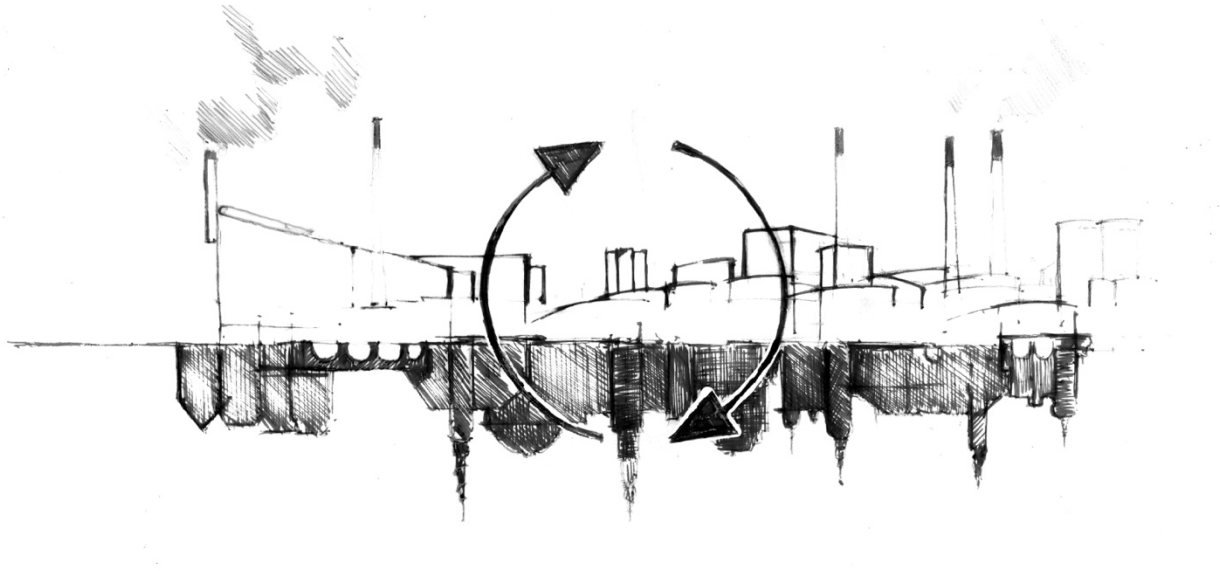
CBS
COPENHAGEN
BUSINESS SCHOOL
HANDELSHØJSKOLEN

DESIGNING PUBLIC-PRIVATE INNOVATION PARTNERSHIPS



A case study of PPIs for waste management in Copenhagen

MSocSc in Strategic Design and Entrepreneurship
Master Thesis | CSDEO5000E | Contract no. 19042

Barbara Svigova (133788) & Julia Betz (133310)
Supervised by Karl-Heinz Pogner
268 241 Characters | 108 Pages
17th May 2021

Acknowledgments

We would like to express our gratitude to various people that have accompanied and supported us in the process of writing our master thesis.

Firstly, we would like to thank our supervisor, Karl-Heinz Pogner, whose advice and curiosity guided us through the development of our master thesis.

Furthermore, thanks to Jonas Åbo Mortensen for giving us the chance to study Circular Copenhagen and connecting us with the partners from the analyzed innovation partnerships. In this regard, we would also like to thank our interviewees for sharing their experiences and insights with us and acknowledging our research by showing great interest.

Ultimately, we are very grateful to both our families and friends for their support, love, and encouragement throughout the two years of our master's education at Copenhagen Business School.

Barbara & Julia

Abstract

The purpose of this master thesis is to investigate how to design public-private innovation partnerships (PPIs) to drive their innovative outcomes. The authors aim to identify the enablers for and barriers to innovation in a qualitative case study of three PPIs focused in the waste management sector at the municipality of Copenhagen in Denmark. Using the analytical tool of thematic networks, the authors analyze data collected in eighteen semi-structured interviews with partners from the studied PPIs as well as external experts within the fields of public-private collaborations and innovation. Literature from the fields of public-private (innovation) partnerships, collaborative governance, and innovation studies with a focus on design thinking is used to interpret and generalize the findings from the interviews. As a result of the analysis, the authors develop a PPI framework representing the factors that impact the innovative outcomes of public-private innovation partnerships. With diversity as an overarching driver for innovation, the framework integrates the factors into six dimensions – system context, commitment, alignment, leadership, innovation development, and collaborative outcomes – that build on each other in the course of a public-private innovation partnership. Furthermore, the authors identify project-specific influences on the innovative outcomes, such as co-creation and third-party funding.

The PPI framework provides implications for practitioners on how to design PPIs. Despite the master thesis's scope being limited to the Copenhagen waste management context, the authors propose the use and adjustment of the PPI framework in other sectors and regions as well. Furthermore, the case study provides theoretical implications for PPI research as the authors argue for the need of a cross-disciplinary approach combining public-private partnerships research with innovation studies. The master thesis reveals that the existing PPI literature neglects, among other topics, the role of citizens, co-creation, experimentation, iteration, and upscaling, which are all essential aspects of PPIs.

Keywords: Co-creation, Design thinking, Innovation, Multidisciplinary collaboration, Public-private innovation partnerships, Thematic networks analysis, Waste management

Table of Contents

List of Figures

Introduction

Problem Statement

While cities drive economic growth and social development, they also pose numerous challenges to sustainable development, often leading to environmental degradation. It is therefore imperative that cities strive for solutions contributing to a more sustainable urban development, which can be enhanced through collaborations between the public and private sectors as well as the citizens (UN-Habitat, 2011; 2020). Furthermore, such multidisciplinary partnerships have the potential to provide innovation that can assist in solving environmental challenges and in accelerating sustainable development (International Resource Panel [IRP], 2018; UN-Habitat, 2011). This potential is particularly substantial in the waste management sector as the rapidly mounting municipal solid waste significantly contributes to environmental degradation (Hoornweg & Bhada-Tata, 2012).

Scholars generally agree that public-private partnerships (PPPs), as one form of multidisciplinary collaboration, can provide public service delivery with added value for all involved stakeholders (e.g., Hodge & Greve, 2007; Huxham & Vangen, 2000; Klijn & Teisman, 2003). Furthermore, a more recent form of PPPs, public-private innovation partnerships (PPIs), is characterized by joint development of innovative solutions that have the potential to address complex common challenges (Brogaard, 2017; Dittmer et al., 2009). Nevertheless, there is a lack of understanding of the factors that enhance innovative outcomes in PPPs (Carbonara & Pellegrino, 2020; Lember et al., 2018), and even in PPIs, which have innovation as their objective (Evald et al., 2014).

Research Question

Based on the above-described problem statement and identified research gap, we argue that there is a need for a better understanding of the factors that drive innovative outcomes in PPIs, as they can contribute to sustainable urban development. For this reason, we developed the following research question:

How can public-private innovation partnerships in the waste management sector be designed to drive innovation?

To be able to answer this question, we first need to understand the nature of PPIs. For this purpose, we study the existing PPP/PPI research. Furthermore, to determine how PPIs should be designed, we have to understand how PPIs work in practice and which factors enable or constrain innovation

in PPIs, particularly in the waste management sector. For this reason, we conduct a qualitative case study of three Danish PPIs that are related to the Copenhagen municipality's innovation platform Circular Copenhagen and tackle challenges within the waste management sector. In our research, we interview partners from the three studied PPIs, as well as external experts who are practitioners within the fields of PPPs, innovation, and waste management. We believe that, on this basis, we can make recommendations for how to design PPIs.

In our study, we do not restrict ourselves to investigating only one form of innovation, as we assume that the analyzed partnerships include various forms of innovation, e.g., product, service, process, or value chain innovation, which are defined in the *Theoretical and Conceptual Framework* section.

Structure of the Thesis

The master thesis is structured as follows. After the *Introduction* section, the context of our research is described in the *Background* section, providing a deeper understanding of the waste management sector, and introducing the case organization, Circular Copenhagen. It is followed by the *Literature Review* section, in which we examine existing research on public-private partnerships as well as on their relation to innovation. Afterwards, the *Methodology* section explains the philosophy of science and the research design of the thesis. Adopting a qualitative case study approach using semi-structured interviews, we introduce the three studied PPIs and our interviewees. Lastly, the section describes our approach to the data analysis, using the thematic networks tool, and elaborates on our methodological limitations and considerations. With the methods in place, the sections *Conceptual and Theoretical Framework* and *Analytical Framework* introduce and combine the concepts of innovation and collaborative governance, leading to the construction of an analytical framework. In the *Analysis* section, we analyze the data from our interviews with the partners, comparing it to the expert interviews and the reviewed literature and concepts. The section is concluded with a PPI framework which we develop based on our findings and which provides an answer to the research question. In the following section, *Discussion*, we provide theoretical and practical implications drawn from our findings, as well as the limitations of our case study and suggestions for future research. In the last section, *Conclusion*, we summarize our main findings and the contribution that our master thesis provides for both PPI theory and practice.

Background

The following section provides an overview of the context of our research, elaborating on the problem statement and further establishing the relevance of the thesis. First, the section outlines the challenges of rapid urbanization and waste generation. Second, we describe municipal waste management and circular economy both in a general sense and specifically in the municipality of Copenhagen. We then introduce our case organization, Circular Copenhagen, and give a brief overview of the concept of public-private innovation partnerships in Denmark.

Urbanization and Waste Generation

Cities are accountable for 60 to 80% of the world's energy consumption as well as up to 70% of greenhouse gas emissions (UN-Habitat, 2011, p. 52). The negative effects of high levels of production and consumption in urban areas are amplified by rapid urbanization. According to United Nations' estimates, over 55% of the world's population, that is 4.2 billion people, lived in urban areas in 2018, while this number is expected to rise to 68% by 2050 (United Nations, Department of Economic and Social Affairs [UNDESA], 2019, p. 5). As this trend is further emphasized by an overall population increase, the urban population in the year 2050 is expected to comprise of 6.7 billion people (UNDESA, 2019, p. 1).

Given the speed of change, swift action is required by public authorities to adapt the cities and their infrastructures to the needs of their growing populations while ensuring sustainable development in all its forms – economic, social, and environmental (UNDESA, 2019; UN-Habitat, 2011). This need is articulated, among others, through the *United Nations' Sustainable Development Goals* (hereafter SDGs), specifically *Goal 11: Make cities and human settlements inclusive, safe, resilient, and sustainable* (United Nations, 2015). One of the objectives under *Goal 11* is to "reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management" (United Nations, 2015, p. 24). According to a World Bank report by Hoornweg and Bhada-Tata (2012), the volume of municipal solid waste (hereafter MSW), a pollutant with highly detrimental effects, is increasing even faster than the rate of urbanization. In 2012, the amount of MSW corresponded to 1.3 billion tonnes per year with 1.2 kilograms of waste per person per day, while it is expected to rise to 2.2 billion tonnes by 2025 (Hoornweg & Bhada-Tata, 2012, p. 8). The per capita rates vary significantly among different countries and cities, although typically "the higher the economic development and rate of urbanization, the greater the amount of solid waste produced" (Hoornweg & Bhada-Tata, 2012, p. 8).

Municipal Waste Management and Circular Economy

Solid waste management is usually handled by local governments and, according to the World Bank (Hoornweg & Bhada-Tata, 2012), “municipal solid waste managers are charged with an enormous task: get the waste out from underfoot and do so in the most economically, socially, and environmentally optimal manner possible” (p. 1). MSW practices include source reduction, collection, recycling, incineration, or landfilling (Hoornweg & Bhada-Tata, 2012). According to the United Nations (UN-Habitat, 2011; 2020), the public sector should collaborate with the private sector and citizens in order to achieve a more sustainable urban development, including sustainable waste management. Moreover, such public-private partnerships have the ability to accentuate the role of cities as hubs for innovation with the potential to tackle urban climate change issues and enhance sustainability (Torfing & Triantafillou, 2016; UN-Habitat, 2011).

To confront the consequences of rapid urbanization and related resource requirements, the United Nations provides several recommendations for cities on how to ensure socially inclusive, resource-efficient and sustainable urban development. Among other things, the recommendations emphasize the importance of developing resource strategies on a local government level, promoting city-level innovation and experimentation, as well as transitioning from linear to circular urban economies “by extracting more utility from so-called ‘waste’ streams” (IRP, 2018, p. 26). The predominant linear economic model is based on unidirectional production that favors consumption of single-use products leading to waste mounting (Esposito et al., 2018; European Parliamentary Research Service [EPRS], 2018). As a response to this issue and induced by an overarching aspiration for more sustainable approaches, the concept of circular economy has been gaining increasing attention among both scholars and practitioners (Kirchherr et al., 2017).

There are many different definitions of circular economy. According to Ellen MacArthur Foundation (n.d.), a leading organization in promoting circular economy globally, it is based on three main principles: design out waste and pollution, keep products and materials in use, and regenerate natural systems. In an analysis of over 100 definitions, Kirchherr et al. (2017) provide the following definition:

> A circular economy describes an economic system that replaces the ‘end-of-life’ concept with reducing, alternatively reusing, recycling and recovering materials in production/distribution and consumption processes. It operates at the micro level (products, companies, consumers), meso level (eco-industrial parks) and macro level (city, region, nation and beyond), with the aim to accomplish sustainable development, thus simultaneously creating environmental quality, economic prosperity and social equity, to the benefit of current and future generations. It is enabled by novel business models and responsible consumers. (p. 229)

To enable the implementation of circular practices in cities, policy makers have to create a favorable environment. That can be achieved, for instance, through setting a direction towards circular economy, facilitating dialogue across sectors or providing a regulatory framework that supports public-private collaboration, innovation and investment fostering the transition (Ellen MacArthur Foundation, 2021; OECD, 2020). A particularly important aspect of circular economy is that it cannot be implemented by a single organization. Rather it requires a holistic approach and collaboration across the entire value chain (Ellen MacArthur Foundation, 2021; OECD, 2020; Winkler, 2011).

Waste Management in Copenhagen, Denmark

In Denmark, the amount of municipal waste generated per capita exceeds 800 kilograms every year, which is the highest figure among all EU countries (Eurostat, 2021). Only 1% of the waste is landfilled, however, little over half of the waste is incinerated, while the rest is recycled (EPRS, 2018). According to the Danish Environmental Protection Act, Danish municipalities are responsible for handling both household and commercial waste, however, recycling of commercial waste is the individual companies' responsibility (Miljøstyrelsen, n.d.). The waste schemes may vary from municipality to municipality, but they always have to fulfill the requirements stipulated by the Waste Order (Bekendtgørelse om affald, 2020) established by the Ministry of the Environment.

In the Danish capital, Copenhagen, waste management responsibilities fall under the Technical and Environmental Administration, specifically the Department of Planning, Analysis, Resources and CO2 also known as PARC (Københavns Kommune, n.d.). Every six years, the Technical and Environmental Administration develops a waste management plan – in 2019 it has launched the *Circular Copenhagen: Resource and Waste Management Plan 2024* (hereafter referred to as *RAP24*) (Københavns Kommune, 2019). The plan presents politically adopted objectives as well as concrete measures to be taken in the period 2019-2024. Its three main targets are: 1) 70% of the municipal waste should be recycled in 2024; 2) the reuse rate should be tripled by 2024 compared to 2016; 3) CO2 emissions should be reduced by 59 000 tons by 2024 (Københavns Kommune, 2019, p. 8).

Circular Copenhagen

Among other things, the RAP24 incorporates the adoption of circular economy in Copenhagen, promoting collaboration across value chains (Københavns Kommune, 2019). For this purpose, the RAP24 introduces the organizational configuration *Circular Copenhagen* (hereafter also referred to as CC), which has been established in 2020 under the PARC department (Circular Copenhagen, n.d.; Københavns Kommune, 2019, p. 34). The aim is to provide an innovation platform to develop

solutions that tackle specific challenges in the waste management sector in collaboration with key stakeholders. The rationale behind this initiative, corresponding to the above-described recommendations by the UN etc., is that cities have the responsibility to take an active role in transitioning from a linear consumption and waste system towards a resilient circular economy. Moreover, the complexity of challenges within this transition demands for a collaborative approach between different actors across value chains and industry sectors (Circular Copenhagen, n.d.; Københavns Kommune, 2019).

Circular Copenhagen identifies five main challenges that they want to address in the circular economy transition: rethinking the design of products to enable their reusing and recycling, reducing the generating of waste and reusing waste as a resource, reaching high-quality recycling through advanced technologies, improving waste collection schemes, and preserving the value of reused and recycled products. In order to solve the challenges, CC aims to initiate various innovation partnerships in collaboration with the industry and research sector (Circular Copenhagen, n.d.).

Public-Private Innovation Partnerships in Denmark

Circular Copenhagen's aim to develop innovation partnerships with the private sector is not unusual in Denmark. In recent years, cross-sector collaborations have been increasingly implemented in Denmark with the intention of finding innovative solutions for public service delivery (Brogaard, 2017; Dittmer et al., 2009). Brogaard (2017) further elaborates on this development:

> As a Scandinavian country, Denmark represents an extensive welfare system and public sector that accounts for a large part of the Danish economy, which implies a growing need for new solutions to ensure efficient and sustainable public services. This need has led to a proliferation in the use of innovation-oriented PPPs in Denmark, which are often referred to as public-private innovation partnerships (PPIs). (p. 1189)

According to Dittmer et al. (2009), "the outcome of the various partnerships has been diversified into works, product and service innovation as well as development of new internal processes in the public sector" (p. 241). As PPIs have increased in popularity in Denmark, a significant amount of PPI literature is either focused on the Danish context or is based on Danish partnerships (see for example Brogaard, 2017; Brogaard & Petersen, 2014; Dittmer et al., 2009). Moreover, the Danish regulatory framework recognizes PPIs as one of the most common public-private partnership types (Konkurrence- og Forbrugerstyrelsen, 2020). Nevertheless, there is a great variety in the design and implementation of PPIs (Indén & Olesen, 2012).

Literature Review

In the following section, we provide an overview of the concept of public-private partnerships and its embodiment in the existing academic literature. Based on our research interest, we elaborate on the roles that the public and private sectors typically assume, their incentives to join the partnerships, the various enablers for and barriers to both the establishment and the successful implementation of PPPs as well as the PPP process itself. Furthermore, we examine the relationship of innovation and PPPs in current literature with a focus on factors that influence the innovativeness of the partnerships' outcomes. Lastly, we introduce a specific and more recent partnership type, public-private innovation partnerships, which is the subject of our research.

Public-Private Partnerships

The PPP Concept

Public-private partnerships or so-called PPPs have become a rather substantial phenomenon among governments all over the world in many fields, from health and social infrastructure to transport and public utilities, including waste management (Hodge & Greve, 2013; Klijn, 2010; Klijn & Teisman, 2003; Yescombe & Farquharson, 2018). Despite their increasing occurrence, the concept is characterized by inconsistency related to its definition as there is a vast variety in types and forms of PPPs (Hodge & Greve, 2013; Li & Akintoye, 2003; Peters, 1998; Warsen et al., 2018). Providing a rather general definition, Van Ham and Koppenjan (2001) identify PPPs "as co-operation of some durability between public and private actors in which they jointly develop products and services and share risks, costs and resources which are connected with these products or services" (p. 598). What the two authors emphasize as the main difference between such partnerships and contracting out is the role of the participants – in PPPs, the government is an equal partner to the private actors, the partners define the objectives and conditions of the collaboration together and combine their resources and expertise to create a solution that could not be reached by neither of the parties individually.

However, some authors (e.g., Hodge & Greve, 2007; Peters, 1998) point out that providing one overarching definition of the concept might not even be possible since the many variations of arrangements categorized under the PPP concept are simply too different. For instance, they differ in the actor composition in the partnerships, the degree of the partnerships' formality, and the purposes of the partnerships and their underlying policies (Peters, 1998). Therefore, Hodge and Greve (2007)

argue that the PPP concept encompasses at least five different families of possible collaboration types:

1. Institutional cooperation for joint production and risk sharing
2. Long-term infrastructure contracts (LTICs)
3. Public policy networks
4. Civil society and community development
5. Urban renewal and downtown economic development (p. 547)

Both in research and in practice, large infrastructure projects often dominate the PPP discourse (Hodge & Greve, 2013; Hodge et al., 2018; Klijn, 2010). Those originate in the British concept of Private Finance Initiative (PFI) proposed in 1992 (Hodge et al., 2018, p. 1106), which, together with US urban governance literature, also laid the foundation for the modern understanding of PPPs (Hodge et al., 2018).

However, taking into account the various understandings of public-private partnerships, Peters (1998) provides the following set of characteristics shared by most such partnerships:

- involvement of two or more actors, at least one of which is public
- each partner has the authority to act on its own
- the relationship is enduring and continuing
- each partner brings some resources to the table
- shared responsibility for the outcomes (p. 12-13)

Similarly, Hodge and Greve (2013) evaluate several PPP definitions in which they find two common key concepts: shared risk and innovation. The first one ties to another often-found aspect of the partnerships – power sharing while collaborating. The latter one is what arguably distinguishes PPPs from *ordinary* collaborations – in PPPs, public and private parties are expected to work together on finding novel solutions, ideally through a long-term relationship. They can be found at various governmental levels, from local and regional partnerships to national and international collaborations (Hodge & Greve, 2013).

This section makes it clear that PPPs are a thriving concept among both researchers and practitioners. However, due to the existence of a vast variety of PPP types (Hodge & Greve, 2007), there is not a unifying definition of the concept. Nevertheless, various researchers (e.g., Hodge & Greve, 2013; Peters, 1998; Van Ham & Koppenjan, 2001) agree on several PPP characteristics, such as

joint development of the solution, collective contribution of resources, and risk sharing between the partners.

PPPs in Academia

Just as PPPs have been gaining popularity in recent years, the amount of PPP literature has grown rapidly in the past two decades (Marsilio et al., 2011; Song et al., 2016; Wang et al., 2018). PPPs are studied from the point of view of a variety of disciplines – for instance, public administration, political science, (public) management, economics or accounting and public finance – using different logics, such as democratic governance, power and its use, project delivery effectiveness and efficiency or financial accountability (Hodge et al., 2018; Wang et al., 2018). According to Song et al. (2016), the most prominent disciplines are engineering, business and economics, and public administration. However, Hodge et al. (2018) argue that there has been "disappointingly little cross-over between the disciplinary groups" (p. 1113).

Several authors have conducted literature reviews of the research on PPPs, each taking a different perspective. For instance, Marsilio et al. (2011) analyzed PPP literature in order to identify the main clusters of concepts connected with PPPs. One of the two most significant clusters they found constitutes theoretical frameworks for PPP analyses provided by public administration scholars. Within the cluster, they highlighted two main approaches – one stemming from transactions cost economics theory viewing PPPs as a contract to reduce the costs of public services provision, and another one including more social aspects by approaching PPPs as a network. The second cluster consists of intergovernmental organizations that promote PPPs and publish empirical studies and statistics on the diffusion and implementation of PPPs in developing countries.

Wang et al. (2018) conducted a literature review of articles published within the public administration discipline, finding four main topics – definition of the PPP concept, risk sharing, drivers for adoption of PPPs, and their performance evaluation. The authors conclude that there is not a general agreement among authors within those four topics. Song et al. (2016) studied the trends within PPP research, arguing that they are shifting. Articles used to focus mostly on procurement management, PPP legislation, concession, PPP project governance, critical success factors or value for money, whereas in more recent literature, there is an evident interest in risk allocation, contract management, renegotiation of concession contracts, real option evaluation and performance evaluation.

Zhang et al. (2016) conducted a review of PPP literature focusing on the Chinese context in both Chinese and international journals. They find that most articles deal with different PPP models, financing, risk management, legal and procurement issues as well as government regulation. In their evaluation of the undertaken research on PPPs, Hodge et al. (2018) emphasize two main areas –

PPP performance evaluation and the various factors that make PPPs work – while they point out that the existing research has been heavily based on case studies. They conclude by claiming the following: “It is clear that in many ways we are still just starting out on our journey to find out how PPPs really ‘work’ and how to improve infrastructure delivery through stronger public and private collaboration” (Hodge et al., 2018, p. 1116).

In terms of industries, a majority of PPP studies focuses on infrastructure, from transportation to energy or waste water treatment (Song et al., 2016; Zhang et al., 2016). Song et al. (2016) find that transportation, and construction and building technology are among the predominant fields of PPP research. Other areas include, for example, public housing projects or city development projects (Zhang et al., 2016). However, none of the literature reviews described in this chapter found PPP research addressing projects in solid waste management, which are the focus of our research. Nevertheless, in our search for PPP literature, we identified several articles focusing on this area. Since a comprehensive and detailed analysis of the topic would exceed the scope of this master thesis, in the following section we give only a brief overview of PPP studies in waste management to understand the position of our research in the existing literature.

In our review of PPP literature about waste management, we found two main shared features. Firstly, articles about PPPs in waste management are often based on studies from developing countries (e.g., Ahmed & Ali, 2006; Awortwi, 2004; Forsyth, 2005; Massoud & El-Fadel, 2002). For instance, Awortwi (2004) exposes the tensions between PPP outcomes and expectations in Ghana, arguing that without implementing important fundamentals in the PPP regulatory framework, the partnerships cannot be successful. Massoud and El-Fadel (2002) analyze the different approaches to involving the private sector in waste management in Lebanon and propose various approaches to manage the partnerships with the public sector.

Secondly, in contrast with most literature about PPPs from industries other than waste management, many authors emphasize the importance of collaboration with the citizens or civil organizations, particularly in developing countries (e.g., Forsyth, 2005; Ahmed & Ali, 2006; Kruljac, 2012). Ahmed and Ali (2006) describe how citizens are often overlooked as potential partners in public service delivery and they explore ways in which people can contribute to the projects. They have their role, for instance, in improving the accountability and transparency of both sectors if they are provided with a common discussion platform. In their case study in Bangladesh, Ahmed and Ali (2006) found that facilitating agencies are essential in establishing public-private-people partnerships, helping to build trust and to facilitate dialogue between partners.

Forsyth (2005) claims that if there is a public debate in place about the purpose and inclusivity of PPPs, then the partnerships can benefit the public and private sectors as well as the citizens "by reducing the costs of and possible resistance to new investment, and by allowing citizens the chance to make partnerships more relevant to local needs" (pp. 429-430). Similarly, Kruljac (2012) argues that "the problem of applying PPPs to developing countries […] is the necessity to include the informal sector when creating these partnerships" (p. 231). Outside of the context of developing countries, for example Ibitayo (2002) emphasizes the importance of public trust and involvement in managing hazardous waste management facilities in Arizona through PPPs.

The examined literature reviews reveal that PPPs are the subject of various research disciplines. However, there is a lack of cross-disciplinary approaches in PPP literature (Hodge et al., 2018). Furthermore, the waste management sector is an underrepresented area in PPP research, which is dominated by studies focusing on transportation, construction etc. (Song et al., 2016; Zhang et al., 2016).

Roles and Incentives

Although role division between the private and public actors differs from partnership to partnership, Van Ham and Koppenjan (2001) provide an overview of roles typically assumed by the different sectors. They acknowledge the directing role of the public sector but assign the role of project managers to the private parties. Furthermore, the authors see the role of the public actors in determining the social utility of the partnerships, safeguarding the involved public interests, and monitoring the quality. Even though the public parties ensure market orientation, Van Ham and Koppenjan (2001) argue that they make financially unprofitable investments, and it is the private actors who estimate costs and take care of the financial side of the project. The role of the private sector also lies in providing different types of resources, such as information and technological know-how. Furthermore, public actors play the role of intermediaries in coordination with politicians, while the private actors provide connections to more private parties.

The complex and dynamic character of public-private partnerships often results in the actors handling multiple roles at the same time. It is thus necessary to provide a clear division of the roles and ensure shared understanding for the various types of involvement, especially since the role division is connected to cost and risk allocation as well as the different benefits (Van Ham & Koppenjan, 2001). There is a general belief that PPPs can benefit both the public and private actors (Hodge & Greve, 2007). According to Klijn and Teisman (2003), another premise of joining PPPs is that the potential benefits will outweigh the costs of collaboration. The inherent logic behind the concept and

one of the main reasons for joining such projects is the value added through the collaboration between the two diverse sectors. Huxham and Vangen (2000) call this the *collaborative advantage* and perceive it as "an extremely powerful way of addressing social issues" (p. 293). Both public and private sectors have only limited resources while finding themselves in a world of growing demands as well as opportunities, which makes the interdependencies between them more and more pronounced. By combining their respective qualities, methods and goals, they are able to reach outcomes that neither of them could achieve on their own (Brinkerhoff & Brinkerhoff, 2011; Hodge & Greve, 2007; Huxham & Vangen, 2000; Klijn & Teisman, 2003; Peters, 1998).

There are other, sector-specific reasons for entering into PPP agreements. Initially, the previously-mentioned PFIs served as a way to handle public debt in the UK – private financing allowed the government to provide infrastructure without increasing the debt or putting more pressure on the public-sector budget, inherently providing better value for money for the British taxpayers (Hodge & Greve, 2013). Besides the appeal of private investments, public parties typically choose to collaborate with the private sector to increase efficiency, especially in terms of on-time delivery and accessing specific skills or technology. Furthermore, the public sector often aims to make use of the private sector's market experience and innovative capacity which provide added value to public projects. Another benefit for the government might be transferring certain risks to the private partners (Hodge & Greve, 2013; Li & Akintoye, 2003; Van Ham & Koppenjan, 2001). Hodge and Greve (2007; 2013) see further incentives for the public parties in developing positive relationships with the private sector and in enhancing overall economic development by supporting businesses, especially in difficult market conditions. The private actors, on the other hand, are typically attracted by new investment opportunities and entering new markets as well as the reduced uncertainty stemming from collaboration with the public sector. In some cases, the reasons for entering PPPs might include the private partner's ambition to influence a related policy or to achieve priority in future projects (Hodge & Greve, 2007; Van Ham & Koppenjan, 2001).

The reviewed literature in this section reveals that the role of the public sector in PPPs lies in monitoring the quality and ensuring that the outcome benefits the society, while the private sector's role is to provide resources, market experience, and innovative capacity (Hodge & Greve, 2013; Li & Akintoye, 2003; Van Ham & Koppenjan, 2001). The main premise of PPPs is the gained *collaborative advantage*, referring to the outcomes of the partnerships that can be achieved only through the combination of the public and private sectors' characteristics *(*Huxham & Vangen, 2000). Moreover, the public sector typically seeks to benefit from the private sector's resources and capabilities, while the private sector is often attracted by new investment opportunities (Hodge & Greve, 2007; 2013).

Enablers and Barriers

Jeffares et al. (2013) conducted a comparative study of different partnership evaluation frameworks and toolkits to identify 12 common principles "which in their totality could be interpreted as constituting a vision of an 'ideal' partnership" (p. 183). Those are:

1. clear, aligned and realistic purpose
2. availability of appropriate financial and human resources
3. clarity of motivations, roles, capabilities and contributions
4. sufficient organisational processes and procedures that foster collaboration
5. alignment of partners and policies
6. commitment, ownership and responsibility of partners towards the partnership
7. participative and empowering partnership
8. a culture of collaboration, trust and openness
9. presence (and awareness) of cultural transformation, synergy, efficiencies or exchange
10. definition of success and monitoring and reporting of its performance
11. continual engagement with others, developing and learning
12. clear attribution of benefits, risks and blame (Jeffares et al., 2013, p. 180)

The principles overlap with many enablers for and barriers to PPPs found across PPP literature. For instance, Warsen et al. (2018) investigate the role of relational aspects, specifically trust and managerial activities in the PPP collaboration process, particularly in long-term contract-based partnerships. They argue that previous research on the success of PPPs has neglected the relational aspects and focused rather on performance indicators and monitoring as well as contract characteristics. Nonetheless, their study shows that trust and managerial activities might be even more important than contracts. Similarly, while Van Ham and Koppenjan (2001) emphasize the need for a contractual arrangement to avoid any uncertainties related to the content and strategy of the partnership, they also point out the importance of communication and the necessity for a joint development of the project's definition. They claim the following: "The nature and definition of the project is, for example, to a great extent a social construction and not an objective fact" (Vam Ham & Koppenjan, 2001, p. 598).

Huxham and Vangen (2000) identify similar factors that make partnerships work and enable the above-described collaborative advantage. First of all, they argue that the partners must agree on the aims of the partnership that have to provide some kind of benefits for all participating parties. Secondly, they propose that the different professional languages and values of public and private actors should be managed carefully. Next, they point out that power struggles are not unusual in such

partnerships. The authors argue that managing those challenges, together with building trust among the partners, is essential.

Public-private partnerships face several other challenges. Many of them stem from PPP's inherent characteristic – combining the public and private sectors. Warsen et al. (2020) describe the partnerships as follows: "PPP is a hybrid arrangement in the sense that it cuts across the public and private domains and aims to combine public and private practices that may prove to be hard to align" (p. 125). According to Klijn and Teisman (2003), the public sector aims to fulfill public objectives which are contingent on political conditions, whereas private actors' existence is driven by reaching profits and thus determined by financial conditions. The authors argue that both sectors have inherently different values and strategies to reach their goals which can have consequences for PPP outcomes and might even cause tension. By the same token, Van Ham and Koppenjan (2001) identify some of the differences between the two sectors – for instance, different financial systems or time horizons with private actors focusing on short-term objectives and cash flow generation on one hand and public actors following a long-term perspective on the other hand. Moreover, there are differences in the preferences and orientations among the private parties as well (Van Ham & Koppenjan, 2001).

In their research of barriers to PPPs, Klijn and Teisman (2003) perceive the involvement of various actors and their interdependence as an enormous potential barrier as "it enhances the complexity of decision-making and calls for a huge managerial effort" (p. 142). Similarly, Huxham and Vangen (2000) perceive as a barrier not only the complexity and dynamic nature of PPPs, but also the ambiguity in the composition of the present partners. Warsen et al. (2020) collected data regarding the perceptions of the governance of PPPs from professionals within both the public and private sectors in Canada, Denmark and the Netherlands. Even though they recognized some shared values among the professionals, they conclude that the viewpoints on PPP governance not only vary significantly but are rather difficult to predict. The authors emphasize the importance of understanding the different viewpoints within a partnership as well as permanent communication to avoid misunderstandings and to align expectations. Existing public procedures may also pose a barrier to establishing PPPs – for example, public projects often must be put out to public tender and sometimes private actors might even be excluded from the tender if they had been part of the project development (Van Ham & Koppenjan, 2001). Other obstacles in engaging in PPPs, and specifically PFI-type partnerships, are low citizen engagement and transparency levels, compromising the perceived legitimacy of the projects (Hodge & Greve, 2007).

As previously described, shared risk is often part of PPP definitions. As all partners typically bear high risks, they can easily become a barrier to the establishment of such a partnership (Van Ham &

Koppenjan, 2001). Many of the perceived risks also stem from the differences between the public and private sectors. For instance, on one hand the profit-driven nature of the private sector creates a risk for the public party being exploited to simply generate private profits without fulfilling the policy goals and adding value to the citizens. Moreover, the essential expertise of the private sector might clash with the public sector's aim for dominance in the partnership. On the other hand, political discontinuity on the public side presents a risk of uncertainty for the private sector. Similarly, the lack of agility in the public sector can be perceived as a risk factor by the private actors. Moreover, PPPs, especially large infrastructure projects, can create high costs for the private sector (Klijn & Teisman, 2003; Van Ham & Koppenjan, 2001). Klijn and Teisman (2003) point out that the tensions between the two sectors and emphasis on the limitation of risks often leads to setting up previously tried types of arrangements through contracts which can, however, lead to separation of responsibilities and thus not realizing the potential added value of multidisciplinary collaboration.

Warsen et al. (2018) see trust as an essential counterpart to risk-taking. They claim that "risk is taken in the belief that the other party can be trusted" (Warsen et al., 2018, p. 1168). Moreover, they argue that trust can only be developed and maintained through interaction and open communication. Having trust incentivizes the partners to invest different resources, such as knowledge or time in the partnership. "If there is trust in the partnership, the actors no longer need to calculate all possible negative outcomes, because they expect the other party to take their interests into consideration. Trust is crucial for partnerships to function properly," (Warsen et al., 2018, p. 1168) they claim. Moreover, Van Ham and Koppenjan (2001) argue that "risk management is an important aspect of public–private partnership" (p. 601). They see a barrier in the perceived danger of partners trying to transfer risks onto each other. Therefore, they argue that PPPs can work only if all partners acknowledge and understand their mutual risks and aim to reduce those risks in collaboration.

This section revealed a set of enablers for and barriers to the successful implementation of PPPs. Research identifies trust (Huxham & Vangen, 2000; Jeffares et al., 2013; Warsen et al., 2018), contractual agreements (Van Ham & Koppenjan, 2001), communication and alignment (Jeffares et al., 2013; Van Ham & Koppenjan, 2001), and understanding of the different viewpoints (Warsen et al., 2020) as enabling factors for PPPs. However, the differences between the sectors in terms of their inherent goals, financial systems and time horizons (Huxham & Vangen, 2000; Klijn & Teisman, 2003; Warsen et al., 2020), as well as existing regulations (Van Ham & Koppenjan, 2001), and risks associated with PPPs (Klijn & Teisman, 2003; Van Ham & Koppenjan, 2001) could pose barriers to collaboration in PPPs.

Process

Just as the factors leading to success in PPPs vary in different types of partnerships, there is also not a one-size-fits-all process model. For example, Osborne and Murray (2000) build on their previous work (Murray, 1998; Osborne & Murray, 1998) regarding government-non-profit relationships, to explore the stages of the collaborative process in PPPs. They use Murray's (1998) five-stage model of a collaborative process that includes the precontact phase, the preliminary contact phase, the negotiating phase, the implementation phase and the evaluation and continuity phase. In their case study, previous collaboration experience with the other partners and an already developed level of trust made the entire process easier, especially the negotiation phase. That connects to one of their key findings, that it would be ideal "to build upon existing relationships whenever possible – if this is not possible, then to allow more time to develop the necessary relationships before launching into the actual negotiations and the initial stages of collaboration" (Osborne & Murray, 2000, p. 81). They also argue for starting with less challenging collaborations before moving into riskier projects and for explicit communication about and alignment of the diverse objectives. Other important implications for PPP managers include awareness of the impact of external factors and acceptance and management of competitive tensions (Osborne & Murray, 2000).

In contrast, Yescombe and Farquharson (2018) take a completely different approach as they investigate the process phases from the perspective of contract-based long-term infrastructure projects. They put a lot of focus on procurement and claim that in the early phases of the project, "any initial identification of the project as a potential PPP is just indicative at this stage" (Yescombe & Farquharson, 2018, p. 51). They identify the following project phases: needs assessment, project definition and options appraisal, project economic assessment and selection, procurement review, procurement preparation, procurement, construction, operation, and hand back (Yescombe & Farquharson, 2018, pp. 49-50). Yescombe and Farquharson (2018) also assert the importance of stakeholder management in PPPs. They propose that stakeholder identification should take place not only in the earlier stages of the project but that the stakeholder list should be reviewed and updated on a regular basis. They particularly emphasize the role of users. The authors argue that stakeholder communication should not be only about marketing the project but also about listening to the various stakeholders and meeting their needs.

On a more general level, Van Ham and Koppenjan (2001) emphasize the need for the partnering actors to collectively negotiate the future arrangement. According to them, the actual establishment of a partnership is preceded by a consultation phase, or what they also call the informal phase of a *pre-public-private partnership*. The authors explain:

> During this phase, actors move forward step by step in a joint exploratory process from an uncertain situation in which matters are mainly voluntary and without obligation towards a gradual commitment to the joint enterprise. They explore the possibilities of the project, the group of those potentially involved, the risks involved and the options for managing these. (Van Ham & Koppenjan, 2001, p. 602)

Although informal, the process requires thorough management as well as process agreements since conflicting interests and competitive relations might already be present. The process management is typically facilitated by an actor chosen by the other partners. The arrangements evolve from rather flexible types, such as letters of intent, to binding contracts throughout the process (Van Ham & Koppenjan, 2001). The pre-public-private partnership phase includes several steps. Van Ham and Koppenjan (2001) call them the initiative, the participation, the scope of the project, risk analysis, risk management and role division (p. 603). In the beginning, an actor initiates the process by developing a project proposal in a search for partners and follows by choosing the participants among all the interested parties. As previously mentioned, from that point on, the selected partners have to negotiate and develop the partnership agreement together – from defining the content and scope of the project and dividing the roles between the parties to allocating the risks among the partners in the most efficient way possible. Klijn (2010) developed a similar argument, saying that "the key 'partnership' mechanism involves private parties in the decision-making process earlier and more intensively than is the case with more traditional client-supplier or principal-agent relationships" (p. 71).

Even though there are differences between the existing PPP process models, authors often put emphasis on the initial stages of the process. Those are characterized by defining the project in collaboration and by alignment of the partners' expectations and objectives (Osborne & Murray, 2000; Van Ham & Koppenjan, 2001).

Innovation and PPPs

Innovation is sometimes perceived as the expected outcome of PPPs, combining public service delivery with the innovative capabilities of the private sector. For example, Jeffares et al. (2013) describe PPPs as "transformative agents able to develop approaches to improving services and outcomes above and beyond what would have been possible through existing arrangements" (p. 174). Furthermore, they view innovation as an outcome of the PPP partners' new connections and interactions. As previously outlined, Hodge and Greve (2013) find innovation to be a key shared concept in most PPP definitions as "the public sector and the private sector have to come up with new solutions and 'work together or achieve a common purpose'" (p. 2). Moreover, according to Vam Ham

and Koppenjan (2001), PPPs are not only about achieving innovative products and solutions, but they also require innovative processes, specifically a “renewal in the field of working methods, procedures, arrangements and institutions” (p. 599).

Bossink (2013) makes a connection between PPPs and eco-innovation. He argues that eco-innovation and sustainability can be planned, developed and managed by key stakeholders, including public-private partnership managers. In this way, they differ from national environmental policies in which governments aim to diffuse environmental innovation through a top-down approach. Bossink (2013) describes eco-innovative PPPs as follows:

> The distinctive characteristic of a sustainably innovative public-private partnership is its primary focus on creating a new practice that has ecological, social and societal quality. It searches for new ways to create a new sustainable modus operandi–or, to be more precise, modus co-operandi–for industry. The public-private partnership is an organizational form that is used to experiment and demonstrate and thus to show how the new sustainably innovative practice of the future can look. (p. 84)

Besides the creation of future industry practices, Bossink (2013) emphasizes the role of agreements and so-called *governmental push* for PPPs, meaning that through policy plans, regulation and economic incentives, the government can encourage the establishment of PPPs aimed at sustainability.

Factors Influencing Innovation in PPPs

Despite the above-outlined connection between PPPs and innovation, Lember et al. (2018) claim the following: “While the term ‘innovation’ is frequently used when describing the characteristics of PPPs, previous literature rarely systematically explores the innovation aspects beyond the context of individual PPP projects” (p. 385). Furthermore, there are only a few studies analyzing innovation in public-private partnerships (Brogaard, 2021; Rangel & Galende, 2010). Carbonara and Pellegrino (2020) claim that the few case studies about innovation in PPPs “fail to provide a full understating of the relationship between PPP characteristics and innovation, namely they do not explain whether and to what extent some characteristics of PPP are more likely to foster innovation than others” (p. 141). Nevertheless, several authors study the different factors of PPPs and their impact on innovative outcomes.

For instance, Eaton et al. (2006) derive various stimulants and impediments for innovation in PFIs from the existing literature and categorize them into four different levels. External environment level encompassing factors such as legislation, government or competition; organizational level including shared vision, mechanisms for developing new and creative ideas or risk avoidance; project level

covering factors such as communication, trust or openness to new ideas; and job role level including, for example, autonomy, training or adequate funds. Carbonara and Pellegrino (2020), aiming to provide a more comprehensive understanding than previous research, examine which PPP features lead to innovation based on the analysis of a dataset of multiple PPP projects from the World Bank. They conclude with identifying the following factors fostering innovation: a high degree of private sector involvement, market concentration increasing innovative intensity, performance-based contracts incentivizing the private sector to innovate, government guarantees being used only in case of great level of risk assumed by the private sector, and enhanced level of trust and cooperation among partners.

As previously outlined, the impact of contractual agreements versus the impact of softer, relational aspects is a matter of debate in PPP literature. As PPPs are typically expected to provide innovative outcomes, some authors draw conclusions about the impact of a contract on not only the performance of a PPP but also on the project's innovativeness. For instance, Klijn and Teisman (2003) argue that the partners' effort to minimize risks and separate responsibilities through a contract disables innovative outcomes. Klijn and Koppenjan (2016) elaborate on this claim by studying various contract features and their relation to good performance and innovation. They conclude that contract characteristics do not have a significant impact on innovative outcomes, and even though they are most likely necessary, they cannot guarantee success and innovation.

On the other hand, according to Warsen et al. 2018, "very strict and detailed contracts are counterproductive for the development of creative ideas" (p. 1168). Furthermore, Rangel and Galende (2010) arrive at the opposite conclusion in their study of innovation in Spanish transport PPPs – that contracts can be designed in a way that enhances innovation through three main contract characteristics. Firstly, if various types of risks are assumed by the private sector, the companies are likely to investigate new ways to overcome these through innovation. Secondly, if there is high competition in the bidding process for a public contract, the companies will try to gain competitive advantage through innovation. Lastly, the existence of penalties for deviations in quality, the design for delays in product/service delivery as well as for the causing of environmental problems accelerates the private sector's innovative activities to bypass them. The last point, however, is in direct contrast with Klijn and Koppenjan's (2016) finding that the possibility of sanctions in a PPP contract has a negative impact on performance.

Ysa et al. (2013) argue that collaborations between the public and private sectors "offer a perfect scenario for innovation to emerge" (p. 98). However, in their research, they find that the degree of

innovation in PPPs can be enhanced mostly by institutional factors and leadership factors. The institutional factors constitute the organizational arrangement between the partners, e.g., contractual collaboration or joint venture. The authors claim that “in order to innovate, one must allow other organizations to come closer and interact actively with them” (Ysa et al., 2013, p. 106). Nevertheless, they also point out that the downside of developing innovative products with private partners is that it is much more costly than acquiring an existing product. At the same time, it is almost impossible to predict the final price of a product that is to be developed. The authors therefore argue that, even though organizational arrangements can increase innovative results, “it is important to recognize that this has financial costs and corresponding risks due to the uncertainty that is always present in collaborations” (Ysa et al., p. 108).

In terms of leadership factors, Ysa et al. (2013) emphasize the importance of the role of the public manager in PPPs for innovative outcomes. They find that the three main drivers for innovation are proactive personality, manager’s networking, and entrepreneurial spirit. Brogaard’s (2017) research aims to understand the influence of institutional support, project management, innovation training, and trust on various innovative outcomes in PPPs. Based on an analysis of data from various Danish PPPs in healthcare and social services, the researcher finds that innovation training among all the partners, providing skills needed to facilitate collaborative innovation, has the biggest impact on innovative outcomes. However, Brogaard (2017) points out that it is possible “that innovation training is not unique to PPIs, but rather represents a general condition for innovation processes, or is a proxy for other factors such as the amount of working time employees are allowed to devote to the PPI” (p. 1198).

Furthermore, Brogaard (2017) finds that trust and institutional support, although important, have an impact only on some forms of innovation. Nevertheless, the author argues that “the result demonstrates the importance of support from different management levels and employees to ensure the resources and commitment needed for the innovation process” (Brogaard, 2017, p. 1198). On the other hand, the study disproves the importance of cross-organizational management for achieving innovation, which has been asserted by other studies on PPPs (e.g., Ysa et al., 2013). However, as Brogaard’s (2017) dataset comes from PPPs in social areas, whereas the contradicting studies are based on PPPs in infrastructure and urban planning, she points out that “some factors might not have the same impact on outcome across different policy areas” (p. 1199).

Nederhand and Klijn (2017) argue that stakeholder involvement is a relatively minor research area in PPP literature and, based on a survey of participants in Dutch contract-based infrastructure projects, they examine the factors leading to more citizen involvement and its effect on the project’s

innovativeness. They find that the level of stakeholder involvement differs among PPP types, assuming that the more technical the project is, the fewer societal stakeholders will be included. According to their research, contract flexibility is essential for citizen involvement, whereas for including societal parties, trust presents a more important factor. Moreover, they find that involving more stakeholders has a positive impact on innovative outcomes in PPPs, however, not necessarily on better performance.

The authors studying innovation in PPPs identify various factors that influence the projects' innovative outcomes. Those include external factors as well as shared vision and communication (Eaton et al., 2006), trust (Carbonara & Pellegrino, 2020; Eaton et al., 2006), stakeholder involvement (Nederhand & Klijn, 2017), innovation training (Brogaard, 2017) and various leadership skills (Ysa et al., 2013). There is an ongoing debate between researchers about the impact of contract characteristics on the innovative outcomes of PPPs. While some authors argue that contracts restrict innovation (Warsen et al., 2018), others claim that they can be designed in a way that enhances innovation (Carbonara & Pellegrino, 2020; Rangel & Galende, 2010). On the contrary, some authors conclude that contracts do not influence innovative outcomes at all (Klijn & Koppenjan, 2016).

Public-Private Innovation Partnerships

Public-private partnerships can take many forms, from contractual infrastructure partnerships to a newer form: partnerships "where the public sector and the private sector team up in new innovative formats to solve common challenges" (Hodge & Greve, 2013, p. 3). Partnerships that are specifically aimed at innovative outcomes are often called public-private innovation partnerships or PPIs (Brogaard, 2017). According to Dittmer et al. (2009), the main difference between PPIs and other PPPs is that in PPIs "the parties are partners in development who together explore new, innovate solutions to mutually defined problems" (p. 241). Indén and Olesen (2012) highlight another distinctive feature:

> It is characteristic to PPIs that the result of the innovation process is not known at the beginning of the partnership, since one of the purposes of this form of cooperation is development of new ideas and ways of providing public goods or services by the participating parties. This means that often, it is not possible to specify in a comprehensive manner all requirements concerning the solutions wanted from the beginning of the partnership. (pp. 258-259)

Dittmer et al. (2009) describe the various reasons for joining PPIs among the private sector. They argue that large companies aim to acquire "development experience aimed at a specific market segment" (Dittmer et al., 2009, p. 241). Small companies, on the other hand, seek "to develop a specific product or service to be deployed in the public sector" (Dittmer et al., 2009, p. 241). However, Dittmer et al. (2009) also point out the challenge of including smaller companies in the projects due

to their resource intensity. Other challenges, the authors highlight, are the public sector's rigid procurement rules often standing in the way of innovative collaborations and the private sector's fear of losing competitive advantage by sharing knowledge in the procurement process.

In their literature review on PPI research, Evald et al. (2014) find that the majority of PPI studies focus on the early process and relationship management and overlook the implementation and commercialization of the developed solutions. They also conclude that most PPI research is positioned from the public sector's perspective, therefore lacking the point of view of the private partners. "This focus is important to research if private firms also in the future should be able to see the value in being involved in solving public challenges by jointly developing new solutions with public organizations through Public Private Innovation," the authors argue (Evald et al., 2014, p. 49).

Furthermore, in the final stage of our research process we came across a recently published meta-analysis by Brogaard (2021), which provides a review of international studies examining public innovation and partnerships. Based on the studied literature, the researcher developed an analytical framework that theorizes how different factors impact innovative outcomes in PPIs. Brogaard (2021) divided the factors, representing potential drivers for innovation, into three groups – structural, collaborative process, and participant-driven factors. The most extensive group of collaborative process factors includes coordination, trust, interdependency, shared goals as well as the tension between benefits and drawbacks of diversity. The structural factors represent the contract management and support from as well as the inclusion of both the participants' employees and the citizens. The participant-driven factors comprise of the management of the PPI and the skills and innovation training among the partners. However, the author points out that "the review indicates that research on innovative outcomes of PPIs constitute an emerging field" (Brogaard, 2021, p. 140) and calls for further empirical and theoretical research on the factors influencing innovation in PPIs.

This section introduced public-private innovation partnerships, a specific type of PPPs aiming to develop innovative solutions. Besides their orientation on innovation, PPIs differ from general PPPs in their explorative nature (Dittmer et al., 2009) and uncertainty (Indén & Olesen, 2009). PPI literature lacks the private sector's perspective as well as focus on commercialization of the developed innovation (Evald et al., 2014) and researchers only begin to study the factors impacting PPIs' innovative outcomes (Brogaard, 2021).

Summary of the Reviewed Literature

From the provided literature review, it is clear that despite the increasing amount of PPP literature as well as the growing popularity of the partnerships in practice, the concept is still surrounded by a high level of ambiguity. The vast amount of PPP types makes it difficult to provide a unifying definition of the concept and challenges the generalizability of PPP research findings (Hodge & Greve, 2013; Li & Akintoye, 2003; Peters, 1998; Warsen et al., 2018). The PPP discourse is dominated by studies of large infrastructure projects, especially in the transportation and construction industries, with a focus on areas such as risk and contract management, financing, procurement, performance evaluation, drivers for the establishment of PPPs as well as the definition of the concept itself (Hodge et al., 2018; Song et al., 2016; Wang et al., 2018; Zhang et al., 2016). Innovation or waste management, which are the focus of this thesis, are relatively underrepresented areas in the PPP literature.

Despite the problematic nature of the concept's definition, recurring PPP characteristics include sharing risks, durability of the relationship, equal role of the partners, novel solutions contingent on the combination of the different resources and skills of the two sectors (Hodge & Greve, 2007, 2013; Huxham & Vangen, 2000; Klijn & Teisman, 2003; Peters, 1998). Furthermore, the differences between the public and private sectors, such as their orientation and values or time horizons and agility, have implications for the roles assumed by the different partners and their reasons for joining PPPs. Nevertheless, they can also present challenges to the collaboration (Klijn & Teisman, 2003; Van Ham & Koppenjan, 2001; Warsen et al., 2020). Different authors point out various factors in relation to a successful implementation of PPPs, from contractual agreements and risk management to trust, alignment, and project management (Jeffares et al., 2013; Van Ham & Koppenjan, 2001; Warsen et al., 2018). In regard to the process stages in PPPs, primarily the early negotiation phases of the project are emphasized in the literature (Osborne & Murray, 2000; Van Ham & Koppenjan, 2001).

PPI studies typically focus on areas similar to other PPP literature, such as contract management, risk sharing, trust and project management, while making a connection to the innovative outcomes of the partnerships (Brogaard, 2017, 2021; Dittmer et al., 2009). Moreover, PPI research, building on public innovation literature, also examines the role of public managers and innovation skills in multidisciplinary collaborations (Brogaard, 2017). Nevertheless, most of the reviewed authors argue that PPI research requires furthering to understand the barriers to and enablers for innovation in such partnerships (Brogaard, 2021; Evald et al., 2014).

Methodology

The *Methodology* section first introduces the philosophy of science that underlies our research process, followed by outlining our *Research Design* as a qualitative case study approach. Afterwards, we elaborate on our *Methods of Data Collection*, describing the process of semi-structured interviews in more detail. In the next section, *Data Analysis*, we describe the analytical process using thematic networks analysis. The last section, *Methodological Limitation and Ethical Considerations* reflects on the quality of our research approach and takes micro- and macroethical aspects into account.

Philosophy of Science

In this master thesis, the philosophy of science is regarded from an ontological and epistemological perspective which both influence the underlying viewpoints and intentions of our research process. As described by Saunders et al. (2012), ontology portrays the nature of reality. Two major ontological viewpoints are *objectivism*, representing the assumption that "social entities exist in reality external to and independent of social actors" (Saunders et al., 2012, p. 131) and *subjectivism*, which "asserts that social phenomena are created from the perceptions and consequent actions of social actors" (Saunders et al., 2012, p. 132). Our research approach is designed to investigate different points of view from various interviewees. We intend to discover their different interpretations and actions related to the context in which they operate. Therefore, our research is situated under a *subjectivism* perspective. However, beyond the interpretive philosophy of subjectivism, our study is contributing to the research in our field of interest by confronting the different points of view in an analysis, considering *intersubjective social relations* (Cunliffe, 2008). Thus, we position our study within *social constructionism* under which, according to Saunders et al. (2012), the researcher's role is to attempt to understand the individuals' subjective reality "in order to be able to make sense of and understand their motives, actions and intentions in a way that is meaningful" (p.132).

Epistemology addresses the question of what could be considered as acceptable knowledge. In terms of epistemology, we take a *pragmatist's perspective*, which is characterized as perceiving both observable phenomena and subjective meanings as acceptable knowledge through adopting different philosophical positions. From a pragmatist's point of view, reality is not a static but rather a dynamic phenomenon and, therefore never quite finalized (Saunders et al., 2012). Our study addresses urban challenges derived from rapid urbanization and waste generation which demonstrate the dynamic reality of the urban context. Another characteristic of pragmatism is its focus on interrelations and processual dynamism between social entities (Kelemen & Rumens, 2008), which is reflected in our approach of investigating the collaboration in PPIs. Moreover, Kelemen and Rumens (2008)

argue that a pragmatist's ambition is to provide "knowledge that has consequences for future applications [...] and contributes to better practice" (p. 43). This intention becomes visible in the *Discussion* section of our master thesis, where we provide recommendations for how to effectively design future innovation partnerships.

Research Design

In line with social constructionism and pragmatism, we follow the research design of a *qualitative approach* and choose a *case study* as our research strategy. We consider the qualitative case study approach as a suitable strategy for our field of interest with reference to Yin (2009), who provides a twofold definition of case studies:

> A case study is an empirical inquiry that investigates a contemporary phenomenon in depth and within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident. [...] The case study inquiry copes with the technically distinctive situation in which there will be many more variables of interest than data points and as one result relies on multiple sources of evidence, with data needing to converge in a triangulating fashion, and as another result benefits from the prior development of theoretical propositions to guide data collection and analysis. (p.18)

As previously described, our field of interest, public-private innovation partnerships, describes a contemporary phenomenon that is highly dependent on its context, in our case the waste management sector. Furthermore, the studied phenomenon differs between other political, socioeconomic, and geographical areas. Applying a case study approach for investigating PPIs is also considered as a suitable research strategy by Sørensen and Torfing (2011) who provide the following argument:

> Qualitative case studies are required to fully understand the complex processes and casualties involved in the production of collaborative innovation and to appreciate the role of the social and political actors' different interpretations of the collaborative and innovative processes, outputs, and outcomes. (p. 862)

With regard to Yin's (2009) four basic types of case study designs (see Figure 1), we consider our master thesis as a *single-case embedded design*. This type is characterized by a single case study, which is Circular Copenhagen, with multiple units of analysis, which represent the three innovation partnerships that are connected to CC. The focus of our thesis lies in the units of analysis, the innovation partnerships, within the context of waste management in Copenhagen.

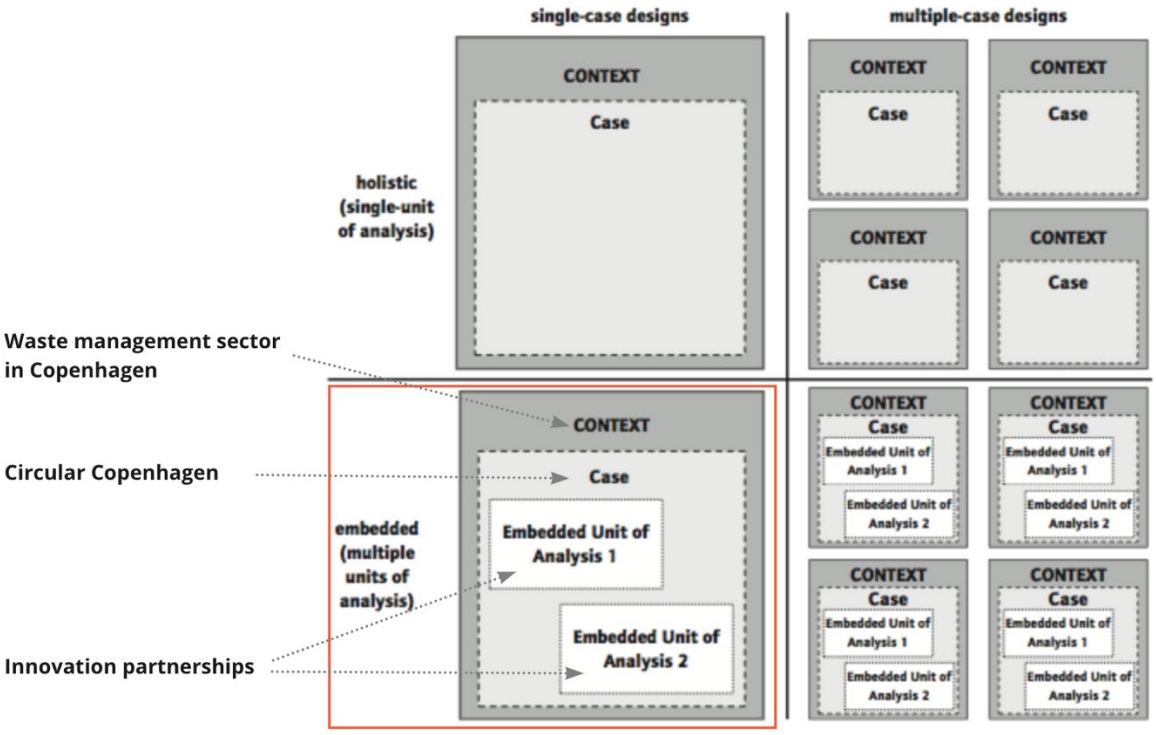


Figure 1: Basic Types of Designs for Case Studies. Adapted from Yin (2009, p. 46).

As Yin (2009) mentions in the definition of case studies, we initially studied existing concepts and theory which guided our collection of data as well as the subsequent analysis. We followed an abductive research approach, going back and forth between theory and our collected data with them mutually influencing each other. We considered abduction as a suitable approach for our case study as it is often used in qualitative research designs (Saunders et al., 2012), and in line with a pragmatist epistemology (Friedrichs & Kratochwil, 2009).

Methods of Data Collection

According to Yin (2009), another characteristic of case studies is the use of multiple sources of evidence and the convergence of them in a triangulating fashion. Thus, we followed a *multimethod qualitative study approach* in our research, which, according to Saunders et al. (2012), is characterized by different methods of data collection. Our secondary data entails mainly desktop research including internal organizational and publicly available project descriptions and reports, as well as information about Danish regulatory frameworks for public-private collaboration and procurement. We used the secondary data to map the context of the waste management sector in Copenhagen which led us to choose Circular Copenhagen as our case organization. Furthermore, the secondary data was used to identify interview partners from CC's innovation partnerships and external expert

interviewees, as well as to develop our interview guide. Our primary data set consists of eighteen semi-structured interviews, which build the basis for our analysis.

In the following, our process of primary data collection through semi-structured interviews is described in more detail. Yin (2009) describes interviews as a fundamental source of case study evidence. The author argues that interviews can provide valuable insights into human affairs and behavioral events which are usually the core of case studies. According to Brinkman (2013), especially semi-structured interviews offer high "knowledge-producing potentials of dialogues by allowing much more leeway for following up on whatever angles are deemed important by the interviewee" in comparison with a fully structured interview (p. 21). Furthermore, the author points out the following characteristics of semi-structured interviews in qualitative research:

> Such interviews are structured by the interviewer's purpose of obtaining knowledge; they revolve around descriptions provided by the interviewee; such descriptions are commonly about life world phenomena as experienced; and understanding the meaning of the descriptions involves some kind of interpretation. (Brinkman, 2013, p. 25)

In order to get an in-depth understanding of the different innovation partnerships of CC and to hear experiences from different points of view, we wanted to interview actors from the public and the private sector as well societal stakeholders representing the interests of the end-users. We intended to investigate how the different partners see each other and their respective roles. Additionally, we wanted to get *neutral* opinions from experts that are not related to CC and their innovation projects, but rather have general knowledge about and experiences with innovation collaborations between public and private entities. Therefore, we conducted two different types of interviews, *partner interviews* and *expert interviews* which are described in more detail in the following.

Partner Interviews

The first interview type is directed towards the innovation partnerships under our case organization, Circular Copenhagen. We conducted four interviews with CC's project director, Jonas Åbo Mortensen, who provided us with insights from all three innovation partnerships from the lens of the public entity. Interviewing the other partners, identified in the following subsections, helped us to understand the collaboration process from the perspective of the private entities and societal stakeholders. As previously mentioned in the *Background* section, circular economy is realized through a closed process chain and collaboration across value chains (Ellen MacArthur Foundation, 2021; Københavns Kommune, 2019; OECD, 2020; Winkler, 2011). Therefore, for each of the following innovation partnerships that are related to CC, we mapped their value chain in order to identify key interview partners:

- Partnership for circular food trays
- Partnership for circular insulin pens (hereafter referred to as Returpen partnership)
- Value chain partnership in the plastics material stream (hereafter referred to as FORCE partnership) (Mortensen, 2018)

The following subsections entail brief descriptions of each partnership (see pp. 122-124 of Appendix A for a more detailed description). Visual illustrations, which are based on the Circular economy systems diagram from Ellen MacArthur Foundation (2015, p. 20), are used to consolidate the understanding of the value chains and illustrate the role of the different organizations within the partnerships. In order to get a comprehensive understanding of the subject, we aimed to interview a variety of different actors across the value chain.

Partnership for Circular Food Trays. Food trays comprise a significant amount of the total quantity of plastic waste from Copenhagen households. To minimize the downcycling of the trays, Circular Copenhagen established a partnership with seven stakeholders from across the value chain (see Figure 2) (Circular Copenhagen, 2020a).

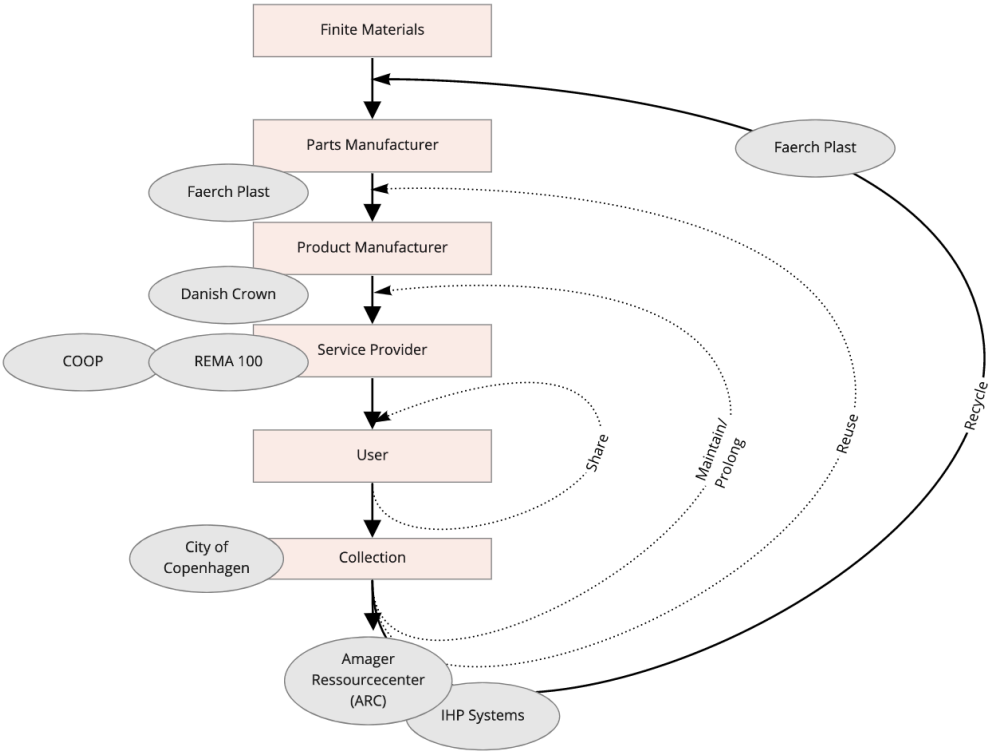


Figure 2: Value Chain for Circular Food Trays. Own illustration based on the Circular economy systems diagram from Ellen MacArthur Foundation (2015, p. 20).

For this innovation partnership, we arranged interviews with the following actors:

- Ida Leisner, special consultant and project manager at Amager Ressourcecenter (ARC)
- Mathias Hvam, CSR project manager at Coop Danmark
- Lars Mensal, managing director at IHP Systems

Returpen Partnership. Circular Copenhagen joined the Returpen partnership initiated by Novo Nordisk, a Danish multinational pharmaceutical company. Novo Nordisk takes the leading role in this innovation partnership that aims for a circular treatment of used insulin pens to ensure a responsible handling of the high-quality materials (Circular Copenhagen, 2020b). To recycle and reuse the used insulin pens, Novo Nordisk is testing a take-back system for the pens in collaboration with stakeholders from the insulin pen value chain (see Figure 3) (Circular Copenhagen, 2020b; Returpen, 2020).

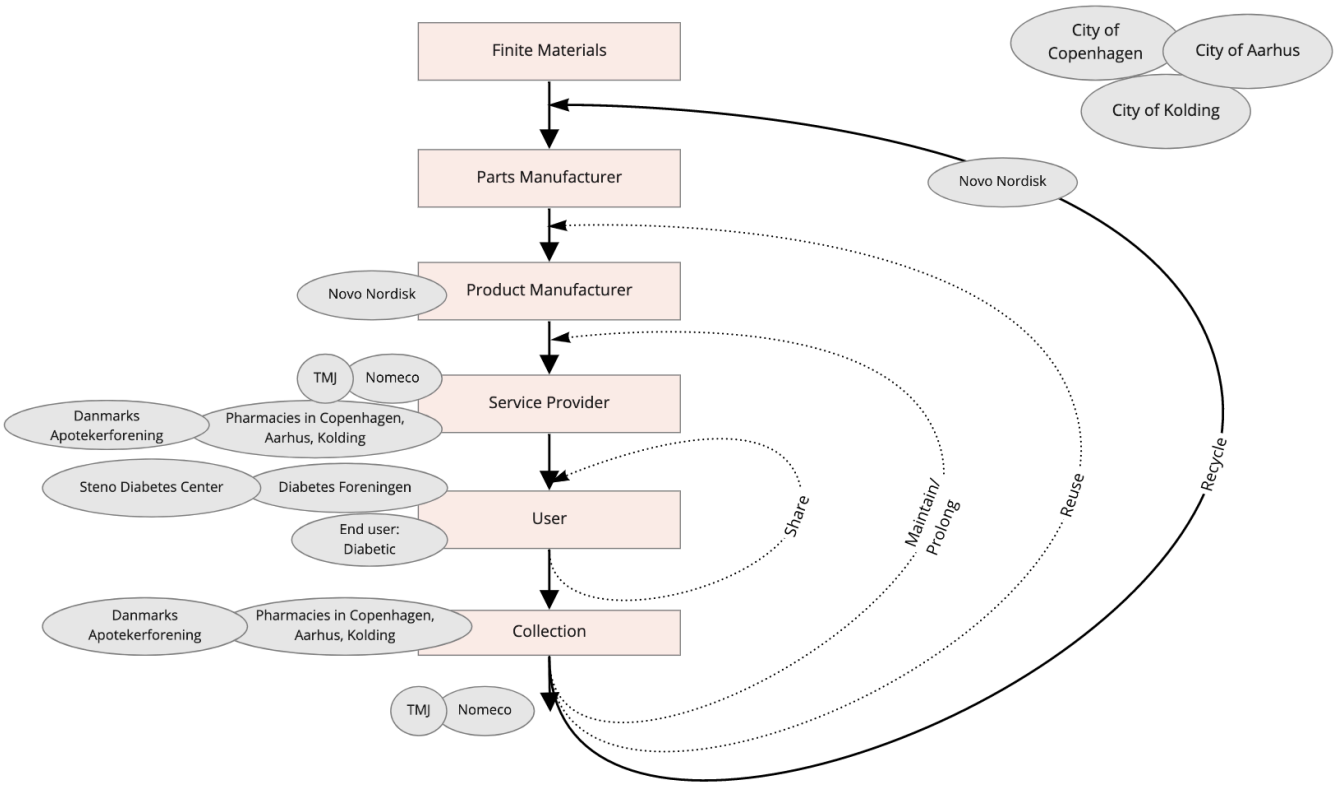


Figure 3: Value Chain for Circular Insulin Pens. Own illustration based on the Circular economy systems diagram from Ellen MacArthur Foundation (2015, p. 20).

We arranged interviews with the following actors:

- Birthe Søndergaard, director of pharmacy practice and health service strategies at Danmarks Apotekerforening

- Thomas Elgaard Larsen, vice president of the senior board at Diabetesforeningen
- Trine Hansen, top level manager at Distribution Denmark[1]
- Jane Wehlast, operations manager at Nomeco
- Niels Otterstrøm Jensen, associate director for corporate environmental strategy at Novo Nordisk

FORCE Partnership. The FORCE partnership falls under the FORCE project, a cooperation initiative funded by the European Commission Horizon 2020 and implemented in four different cities (Copenhagen, Hamburg, Lisbon & Genoa), that aims to minimize the outflow of materials from a linear economy and to transition towards a circular economy (European Commission, 2020). To reach the objectives of the FORCE project within Copenhagen, the municipality established a partnership that included both public and private actors across the plastics material value chain (see Figure 4) (Alimi et al. 2019; FORCE Consortium, n.d.).

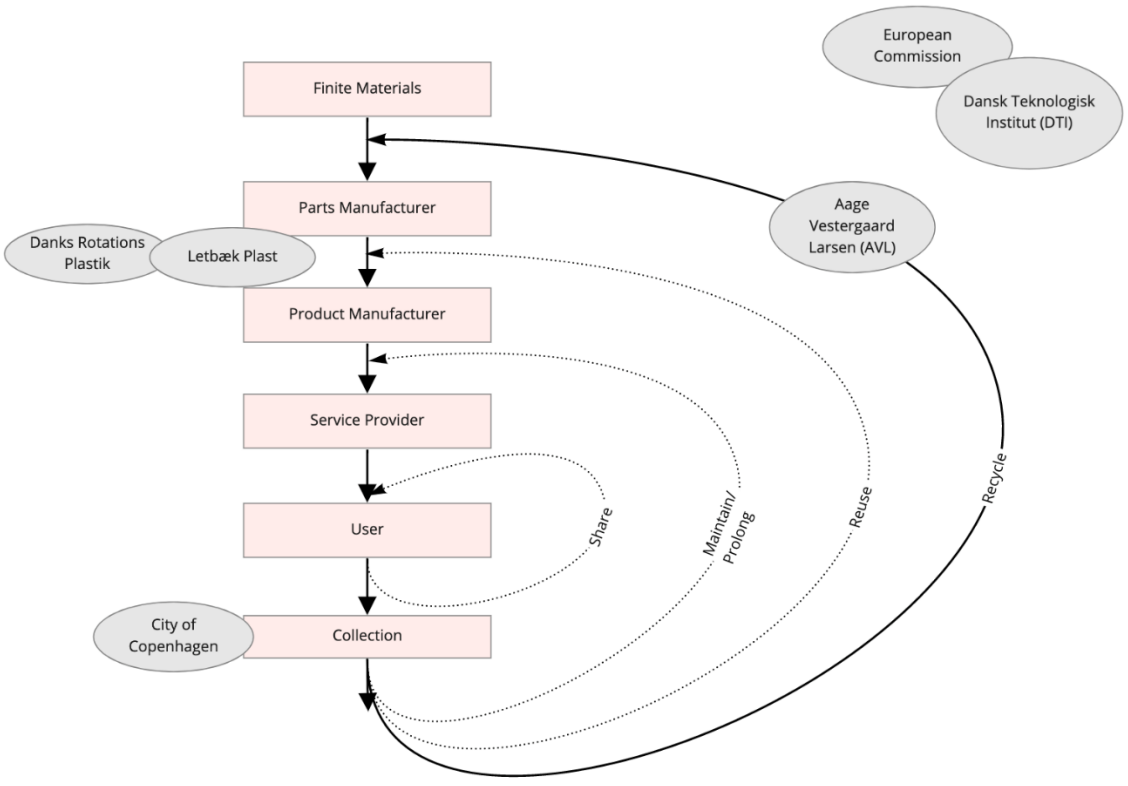


Figure 4: Value Chain for Flexible Plastics. Own illustration based on the Circular economy systems diagram from Ellen MacArthur Foundation (2015, p. 20).

[1] The interviewee's name as well as the company name are pseudonyms as the interviewee wished to be anonymized.

From this innovation partnership, we conducted interviews with:

- Bo Jacobsen, R&D manager at Aage Vestergaard Larsen (AVL)
- Bjørn Malmgren-Hansen, consultant at Dansk Teknologisk Institut (DTI)

Expert Interviews

The second interview type encompasses interviews with various experts, such as consultants and project managers in the fields of public-private partnerships, innovation, waste management, and circular economy, that are not directly related to CC or their specific innovation partnerships. Our intention behind this interview type was to hear from experiences and get knowledge about best practices from innovation partnerships. We identified relevant interviewees based on our secondary data, through mapping of the waste management, circular economy and innovation sectors in Copenhagen. After reaching out and contacting various relevant actors, we eventually conducted interviews with the following experts (see p. 121 of Appendix A for a more detailed description of the experts' roles and their organizations):

- Kathrin Zeller, senior manager of the *Waste to Resources Network* of C40 Cities
- Jakob Stolt, senior project manager at EIT Climate-KIC Nordic
- Toke Sabroe, partner at Leaderlab
- Cristiana Parisi, associate professor in management control at Copenhagen Business School and coordinator of the EU Horizon 2020 REFLOW project

Interview Preparation and Execution

Prior to conducting the interviews, we established one general interview guide including a set of questions (see p. 125 of Appendix A). The interview guide was designed to allow for both thematic and dynamic dimensions – "thematically with regard to producing knowledge and dynamically with regard to the interpersonal relationship in the interview" (Brinkmann & Kvale, 2015, p. 154). First, the interview guide entails a short briefing, defining the situation and purpose of the interview as well as clarifying practicalities regarding audio recording to "allow themselves to talk freely and expose their experiences" (Brinkmann & Kvale, 2015, p. 154). After a short briefing, the interview guide entails questions regarding the interviewee and their role in their respective organization. Second, the guide contains questions about the basic concepts of innovation, circular economy, and PPPs. Third, it includes general questions about match-making processes, different types of PPPs, the actual collaboration process, as well as general challenges, barriers, and enablers connected with PPIs. In the fourth section of the interview guide, we developed more specific questions about potential topics arising throughout the interviews. These specific questions cover goals, visions, risks,

trust, transparency, roles, resources, multidisciplinarity, design thinking, co-creation, inspirations for innovation, timeframe, innovation implementation, and the impact of the current Covid-19 pandemic.

As mentioned earlier, we decided to conduct two different interview types. Therefore, we used the general interview guide as a basis and adjusted it accordingly to the specific category and context of our interviewees. Furthermore, we adjusted the individual interview guides throughout the process based on information gathered in the previous interviews, secondary data acquired through desktop research and theoretical inputs from the literature that we studied simultaneously.

Due to the current Covid-19 pandemic and the associated restrictions, interviews needed to be conducted virtually through video calls, using Microsoft Teams and Zoom. All interviews were held in English. Even though this limited us in observing and analyzing the whole body language of our interviewees and physically observing the organizational context they are operating in, we were still able to grasp their facial expressions and also took advantage of easier access and time savings in the interview process compared to physical face-to-face meetings (Saunders et al., 2012).

Data Analysis

The recorded interviews were transcribed into texts (see pp. 2-315 of Appendix B) with the aid of the audio transcription software Konch. To analyze our data, we implemented the thematic networks analysis described by Attride-Stirling (2001). The approach uses thematic networks, which summarize the main themes in web-like illustrations of *basic*, *organizing,* and *global themes*, to conduct a thematic analysis. This approach serves as a tool to explore the consideration of a subject or the meaning of an idea and consist of six main steps:

1. code material
2. identify themes
3. construct thematic networks
4. describe and explore thematic networks
5. summarize thematic networks
6. interpret patterns (Attride-Stirling, 2001, p. 391)

Nevertheless, our analysis includes two additional aspects compared to the thematic networks tool – analysis of the differences between the studied partnerships and expert input from the interviews.

According to Attride-Stirling (2001), a coding framework can be constructed based on theoretical concepts, based on the gathered data itself, or based on a combination of the two. Following an

abductive research approach, we combined theoretical concepts and our gathered data for building the coding framework. First, each one of us conducted an initial coding process of two randomly selected interview transcripts without any predesigned coding framework in mind. Afterwards, we used the identified recurring themes and combined them with our analytical framework, described further in the *Analytical Framework* section, into a coding framework (see p. 130 of Appendix A). In the next step, we used the established coding framework to review all interview transcripts and dissect them into "meaningful and manageable chunks of text" (Attride-Stirling, 2001, p. 391). For the coding process, we used the data analysis software NVivo.

From the coded text segments, we identified recurring themes, which we then further refined into themes that are "(i) specific enough to be discrete (non-repetitive), and (ii) broad enough to encapsulate a set of ideas contained in numerous text segments" (Attride-Stirling, 2001, p. 392). For identifying the themes, we created a visualization using the online visual collaboration platform Miro (see pp. 134-148 of Appendix A).

In order to construct the thematic networks, we detached from the coding framework and arranged the selected themes into new groupings, which represent our low-order *basic themes.* In the next stage, we clustered our basic themes into similar issues to identify middle-order *organizing themes*. To determine the high-order *global themes* that capture the core statement and principal in the texts, we systematically summarized the organizing themes. We again used Miro to arrange our identified basic, organizing, and global themes and to illustrate the constructed thematic networks (see pp. 149-156 of Appendix A). Subsequently, we explored the networks to identify underlying patterns and relations within and between them. We present and describe the thematic networks in the first part of the *Analysis* section. Parallel to exploring the recurring themes leading to the construction of the thematic networks, we identified differences between the studied partnerships, which complement the findings from the thematic network analysis. Our further addition to Attride-Stirling's (2001) approach is the comparison of the insights from the experts with the constructed thematic networks.

In the last step, we compare the presented findings from both partner and expert interviews to the reviewed literature from the fields of PPPs, PPIs, innovation, and collaborative governance to interpret the thematic networks. Concluding the analysis, we return to our initial research question by proposing a PPI framework that allows practitioners to design partnerships in a way that enhances their innovative outcomes.

Based on the described approach, our analysis unveils itself in four layers, starting with thematic networks analysis, followed by outlining the differences between the partnerships and comparing the

networks with input from the experts, and concluded by connecting all the interview findings with the reviewed literature and concepts.

Methodological Limitations and Ethical Considerations

Existing literature on qualitative case study research suggests some criteria, namely construct validity, generalizability, and reliability, to test and ensure a high quality of a case study research design (Saunders et al., 2012; Yin, 2009). *Construct validity*, which includes the application of a sufficiently operational set of measures for the studied concept, can be ensured by using multiple sources of evidence through triangulation (Yin, 2009). In our research, we therefore gathered our data through a combination of primary and secondary data and the two different interview types. *Generalizability* is concerned with whether findings in a specific context are transferable into another context (Yin, 2009). In qualitative studies, generalizability cannot be achieved through statistical testing, but rather "rests on theoretical understanding of the subject matter" (Brinkmann, 2013, p. 144). By relating our research project to existing theory, we were able to demonstrate the broader theoretical significance of our findings (Marshall & Rossman, 2006) beyond the single case of Circular Copenhagen and its innovation partnerships.

The objective of *reliability* is to ensure that a study could be repeated with identical findings and conclusions (Yin, 2009). However, qualitative interviews cannot be repeated with other participants in the exact same form because they mostly depend on specific situations between the interviewer and the interviewees (Brinkmann, 2013). To still achieve an appropriate level of reliability, Brinkman (2013) argues that researchers can use, for instance, independent coders in the data analysis procedure. Hence, as already mentioned in the *Data Analysis* section, each of us independently established initial codes which were then discussed and aligned into our coding framework. Furthermore, the reliability of qualitative case study research could be enhanced through a comprehensive case study protocol and a case study database in the data collection process (Yin, 2009). Therefore, we implemented detailed documentation throughout the research process which is represented in an extensive and transparent description of our methods and tools in the *Methodology* section.

The quality of case study designs also depends on certain biases that need to be considered throughout the research process. Biases can emerge when the responses of the interviewees are affected by comments, non-verbal behavior, or the tone of voice of the interviewer, which might be due to an insistence on one's own beliefs. Furthermore, the way responses are interpreted might be biased as well. We attempted to minimize these biases through, for instance, ensuring a rich level

of knowledge about the organizational context of the interviewees and through preparing the interview guide with open, probing, and specific questions (Saunders et al., 2012).

A limitation of our case study could be the presence of only one public entity. In our interviews, we obtained insights from multiple private actors, but just one public actor. However, as previously described in the literature review, Evald et al. (2014) argue that PPI research is dominated by the public sector's point of view and lacks the private sector's perspective which might be essential in understanding how to engage them in co-developing innovative solutions with the public sector. Therefore, our case study might contribute to filling this gap.

Ethical considerations are an essential part of every qualitative research that aims to produce and contribute with new and insightful knowledge. Brinkmann and Kvale (2005) distinguish between *micro-* and *macroethics* in qualitative research. In terms of microethics, the authors emphasize the following:

> It is indeed important to obtain the subjects' consent to participate in the research, to secure their confidentiality, to inform them about the character of the research and of their right to withdraw at any time, to avoid harmful consequences for the subjects, and to consider the researcher's role. (Brinkmann & Kvale, 2005, p. 167).

In our research, we took microethical considerations into account by gaining informed consent from interviewees, introducing our field of research, and asking for permission for audio recording at the beginning of each interview. Also, we informed the interviewees that the full transcripts would be confidential, and we offered the possibility of anonymizing the interviewees in the master thesis. In this way, we did not only protect their privacy and confidentiality, but we also created a comfortable atmosphere for the interviewees at the beginning of each conversation, reduced possible interviewee or response biases, and increased the confidence level in our trustworthiness (Brinkmann & Kvale, 2015; Saunders et al., 2012; Yin, 2009).

Macroethics in academic research considers how the publication of produced knowledge affects the broader society beyond the individuals that have actively been part of the interview processes (Brinkmann & Kvale, 2005). The general intention of our research project is to use the interviewees' personal experiences from innovation partnerships to provide recommendations for how to design future innovation partnerships. However, revealing negative experiences of the interviewees and potential barriers to innovation project collaboration could also lead to a discouragement of the actors to enter future innovation partnership.

Conceptual and Theoretical Framework

The previously reviewed literature exposes the need to further examine certain concepts in more detail. Therefore, *Innovation* and the related concept of *Design Thinking* are discussed in this section, followed by an examination of *Public Sector Innovation* specifically. Next, the concept of *Collaborative Governance,* in light of the *New Public Governance* paradigm, is addressed. The concepts and theory described in the following section expose factors that could enable or hinder innovative outcomes in PPIs and investigate the collaborative and multidisciplinary characteristics of PPIs. The discussed concepts and theory in this section ultimately lead to our analytical framework.

Innovation

The broad term of innovation has been defined in multiple ways by different researchers. However, most of them see the work of the economist J. A. Schumpeter as fundamental and influential for several innovation theories (e.g., Bason, 2018; Crossan & Apaydin, 2010; Torfing & Triantafillou, 2016). In one of his works, *The Theory of Economic Development* (1934), Schumpeter identifies innovation as the main driving force for economic development. In most definitions, the term *innovation* is associated with change, knowledge, or creativity. For instance, Amabile (1988) sees creativity as the most important aspect of organizational innovation and defines innovation as "successful implementation of creative ideas within an organization" (p. 126). Crossan and Apaydin (2010) provide a comprehensive definition of innovation:

> Innovation is: production or adoption, assimilation, and exploitation of a value-added novelty in economic and social spheres; renewal and enlargement of products, services, and markets; development of new methods of production; and establishment of new management systems. It is both a process and an outcome. (p. 1155)

As shown in their definition, Crossan and Apaydin (2010) distinguish between two main dimensions of innovation, innovation as an outcome and innovation as a process. Apart from those, Kahn (2018) categorizes innovation based on a third dimension, innovation as a mindset.

In order to portray a comprehensive analysis of factors influencing innovative outcomes in PPIs, the following sections further elaborate on the concept of innovation in all three dimensions.

Innovation as an Outcome

Innovation as an outcome addresses the question of *what kind* of innovation is faced. Scholars differentiate between several forms of innovation: product/service, process, and business model innovation (Crossan & Apaysdin, 2019), as well as supply chain (Arlbjørn et al., 2011) and organizational innovation (Kahn, 2018). The first form, product or service innovation, describes "novelty and meaningfulness or new products introduced to the market in a timely fashion" (Wang & Ahmed, 2004, p. 304). Utterback and Abernathy (1975) describe product innovation as "a new technology or combination of technologies introduced commercially to meet a user or a market need" (p. 642). Process innovation is defined by Wang and Ahmed (2004) as the "introduction of new production methods, new management approaches, and new technology that can be used to improve production and management processes" (p. 305). The third form, business model innovation, represents a change in "how a company creates, sells, and delivers value to its customers" (Davila et al., 2006, p. 32). Supply chain innovation implicates radical or incremental changes of a network, technology, or processes in the value chain (Arlbjørn et al., 2011). Organizational innovations include new forms of working environments and management, and changes in the organizational structure (Kahn, 2018).

As previously described in the *Research Question* section, we assume that the studied partnerships include product, service, process, and supply chain innovation since the other two innovation forms (business model and organizational innovation) are mostly associated with innovation within single organizations. With regard to the degree of newness of innovation, it can be distinguished between *radical* and *incremental* innovations (Crossan & Apaydin, 2010). The latter describes improvements within an already given frame of possible solutions whereas radical innovations define a change of the frame (Norman & Verganti, 2014).

Innovation as a Process

Innovation as a process answers questions of *how* and can be specified by different drivers of innovation. Innovation can be driven internally by the level of knowledge or resources, or externally by new opportunities and regulations in the market. The innovation process could be either a closed process within one organization or an open process that includes the organization's network. Furthermore, innovation can evolve through a top-down or bottom-up approach and can be implemented on different levels, from the individual to the group and the firm level (Crossan & Apaydin, 2010).

Most innovation process models follow similar patterns and process phases, however, with different terminology and degrees of detail. We use the four stages of the Innovation Cycle (see Figure 5), an innovation process model by Eggers and Singh (2009), as a basic structure to outline the reviewed

innovation process research. The innovation process is a non-linear, rather cyclical and highly dynamic process (Van de Ven et al., 2007).

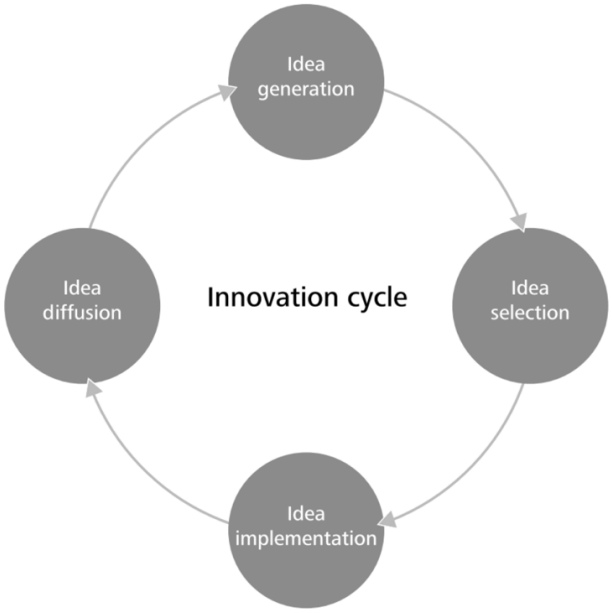


Figure 5: The Innovation Cycle. From Eggers & Singh (2009, p. 7).

The first stage can be described as the *idea generation* or *initiation* phase and entails the discovery and definition of the problem (Crossan & Apaydin, 2010; Eggers & Singh, 2009). This stage requires "recognition of a need" (Utterback, 1971, p. 78), setting shared goals (Egger & Singh, 2009) and a shared agenda (Amabile, 1988). Ideas can be sourced from various multidisciplinary stakeholders, such as external and internal partners, employees, and citizens (Eggers & Singh, 2009). In the *idea selection* stage, relevant ideas are filtered and selected (Eggers & Singh, 2009). Crossan and Apaydin (2010) describe this stage also as *portfolio management* with the objective of "making strategic, technological, and resource choices that govern project selection" (p. 1173). Just like in the first innovation process stage, involving various stakeholders yields advantages since it provides tacit knowledge and valuable feedback. In order to select ideas, Eggers and Singh (2009) suggest mitigating risks, obtaining funds and establishing selection criteria.

Within the *idea implementation* stage of the innovation cycle, ideas are translated into services, products, and practices (Eggers & Singh, 2009). Amabile (1988) describes this part of the innovation process as "testing and carrying out ideas" (p. 162). Furthermore, Utterback (1971) identifies "designing various alternative solutions" (p. 78) as one key aspect of this stage. Eggers and Singh (2009) argue that providing incentives and adopting and maintaining flexibility facilitate innovation implementation. The last stage of the innovation cycle is the *idea diffusion.* This stage refers to the

dissemination of the innovation throughout and beyond the organization (Eggers & Singh, 2009). Other scholars refer to this stage as *market introduction* (Utterback, 1971) or *marketing and communication* phase (Crossan & Apaydin, 2010). Eggers and Singh (2009) highlight the importance of gaining support and acceptance from all the stakeholders in this stage which could, for instance, be reached by promoting and sharing successful achievements throughout the process.

Innovation as a Mindset

Innovative solutions require an innovative mindset of individuals and an organizational culture that favors innovation (Kahn, 2018). The dimension innovation as a mindset addresses the individual level of actors that are involved in innovation processes. The importance of the individual level is also emphasized by Amabile (1988), who identifies individual creativity as central for organizational innovation. Dyer et al. (2001) affirm the crucial role of the individual in their Innovator's DNA model and identify five different *discovery skills* that favor the development of creative ideas for innovation.

The first skill, *associational thinking*, describes the cognitive skills of synthesizing novel inputs by making connections between ideas and problems from unrelated fields. Associational thinking skills result from frequent engagement with the four other behavioral skills, questioning, observing, networking, and experimenting. *Questioning* is about challenging the status quo and being curious. *Observing* skills are needed to be attentive to the surrounding world, new technologies, services, other companies, customers, and products that could give insights for new ideas. Going beyond the individual horizon and stepping into interaction, *networking* with other people provides different points of view and spurs new ideas. The last behavioral skill, *experimenting*, is about prototyping, hypotheses testing, and trying out new experiences. Dyer et al. (2011) argue, that in order to frequently engage with these four behavioral skills, individuals need *courage to innovate* which motivates them to “actively desire to change the status quo [...] [and] regularly take smart risks to make that change happen” (p. 23-25).

Apart from the five discovery skills, Kahn (2018) argues that an innovation mindset also incorporates *cross-functional thinking* and *design thinking* abilities. The following two sections elaborate on the design thinking concept and introduce an innovation process model, the Double Diamond framework for innovation by the British Design Council (2015), which is built on the idea of a design thinking mindset.

Design Thinking – The Innovative Mindset

As previously outlined, design thinking is closely related to innovation. Brown (2008) argues that the general shift towards more human-centered activities in the world’s economy spurs the high potential

of using design thinking in the expanding innovation environment. The strong relation to innovation becomes apparent in Brown's (2008) definition of design thinking as "a methodology that imbues the spectrum of innovation activities with a human-centered design ethos" (p. 86).

The origin of design thinking lies in the core skills of designers in matching what is desirable for human needs with technological feasibility and economic viability. According to Brown and Katz (2009), design thinking enables the application of these skills to a much broader set of problems by people who do not consider themselves to be designers in the traditional sense. Furthermore, design thinking is increasingly adopted in traditional management practices (Liedtka & Ogilvie, 2011; Brown & Katz, 2009). Underlying key principles of design thinking are human-centeredness (Brown, 2008; Design Council, 2015; Liedtka & Ogilvie, 2011; Nakata & Hawang, 2020), experimentative attitude (Brown & Katz, 2009; Lewrick et al., 2020; Nakata & Hwang, 2020), inter- and multidisciplinary collaboration and co-creation (Brown, 2008; Liedtka, 2015; von Thienen et al., 2014), optimism and openness (Brown & Katz, 2019; Lewrick et al., 2020) as well as visualization methods (Liedtka & Ogilvie, 2011; von Thienen et al., 2014).

The Double Diamond Framework for Innovation

Based on the concept of design thinking, the Double Diamond does not only provide a framework for the innovation process, but it also incorporates principles of an innovative mindset, and therefore interlinks the two dimensions. The Double Diamond (see Figure 6) is a "framework for innovation [that] helps designers and non-designers across the globe [to] tackle some of the most complex social, economic and environmental problems" (Design Council, 2015). The framework consists of four key principles, design methods, and the actual innovation process as the core of the framework.

The innovation process within the framework is formed by two diamonds, with each of them illustrating a phase of divergent thinking and convergent thinking. The dynamic between these two modes of thinking – opening up for exploration and closing down through decision making (Brown & Katz, 2009) – is the central aspect of the innovation process framework. Each diamond comprises two of the four innovation process stages. The innovation process stages in the Double Diamond correspond to the four stages that were previously identified in the reviewed literature on innovation processes – idea generation, selection, implementation, and diffusion.

The first stage, *discovery*, serves to understand the problem and requires divergent thinking to find multiple inspirations and to generate various ideas. The next stage is about *defining* the challenge and choosing from various ideas, which requires convergent thinking abilities. Afterwards, in the *development* phase, possible solutions provided by different actors are taken into account. Again, this stage requires divergent thinking abilities in order to be open-minded and inclusive for potential

solutions. The last phase, *delivery,* is about testing, refinement, and choosing the best possible set of solutions through convergent thinking (Design Council, 2015).

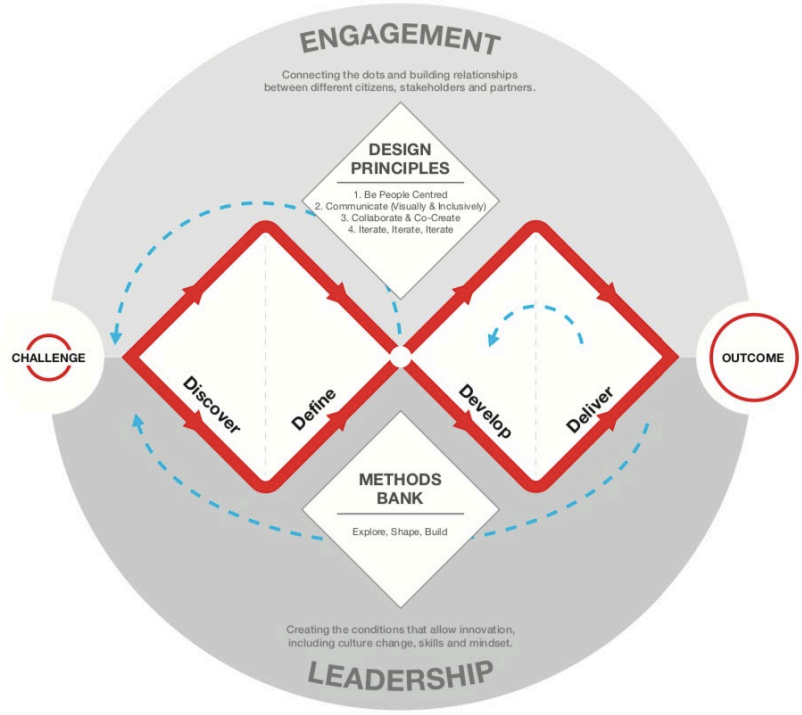


Figure 6: The Double Diamond Framework for Innovation. From Design Council (2015).

The innovation process is affected by four key principles, which are adopted from problem-solving approaches in the design context and correspond with the previously mentioned design thinking principles – human-centeredness, experimentation, multidisciplinary collaboration and co-creation, optimism and openness, and visualization. The first principle of the Double Diamond framework, *put people first,* underlines the importance of a human-centered and empathic approach. The second principle is inclusive and visual *communication* that leads to a common understanding of problems and ideas. As a third principle, *collaboration and co-creation* encourages practitioners to seek inspiration and learn from each other. *Iteration*, the fourth principle, is an enabler for minimizing risks, identifying errors early on, and establishing confidence in one's ideas (Design Council, 2015).

Apart from the process and the principles, the Design Council (2015) highlights the importance of favorable leadership skills for innovation such as having an experimentative attitude, encouraging innovation and capacity building, open-mindedness, agility, and the ability to appreciate and communicate incremental results. Furthermore, innovation requires relationship building and engagement of users and other partners.

In this section, innovation was discussed in a rather general sense within three different dimensions (innovation as an outcome, a process, and a mindset). Furthermore, the connection of the dimensions was amplified in the Double Diamond framework for innovation. With regard to our main case, Circular Copenhagen as a public sector organization, the role of innovation specifically in the public sector will be discussed in the following section.

Public Sector Innovation

Innovations in the public and private sectors differ from each other in the way they provide value. The value of private sector innovations is mostly seen from an instrumental and utilitarian perspective, for instance, cost reduction, maximizing shareholder wealth, increased quantity, and improved quality per unit. On the other hand, public sector innovation is bound by moral and political obligations and provides value for the larger society (Moore & Hartley, 2008; Torfing & Triantafillou, 2016).

Despite the growing interest in innovation strategies and activities in the public sector, public innovation is not a systemic and permanent activity yet. Instead, unexpected events, for instance, criticism from the public, economic crises, budget reductions, or special purpose funding cause innovation to appear only episodically. However, according to Torfing & Triantafillou (2016), innovation might be the tool for seeking better public solutions to solve political, environmental, and societal challenges.

Drivers for and Barriers to Public Sector Innovation

There are various socioeconomic, political, and environmental drivers that spur the need for public sector innovation such as increased citizens' expectations, globalization, and the increasing interconnectedness, the emergence of new digital technologies, socioeconomic shocks and fiscal crises and climate change (Bason, 2018; Torfing & Triantafillou, 2016).

Even though there are several drivers that accentuate the need for public sector innovation, there are also barriers that might hinder or slow down innovation processes in the public sector. Bason (2018) argues that public sector organizations tend to keep their knowledge to maintain their power position and many public sector organizations are trapped in an *anti-innovation DNA,* that embodies complex bureaucratic and hierarchical structures and slow-moving processes. There is also a reluctance to take risks and a lack of explorative mindsets. Moreover, insufficient citizen involvement, a lack of formal innovation processes, as well as missing capabilities for scaling up innovative ideas are further recurring barriers to innovation in the public sector (Bason, 2018; Eggers & Singh, 2009).

The Public Sector Innovation Ecosystem

Barriers to public sector innovation, that were outlined in the previous section, could be conquered by the successful implementation of *innovation ecosystems* (Bason, 2018). In a general sense, innovation ecosystems "allow firms to create value that no single firm could have created alone" (Adner, 2006, p. 2) and can be defined as "collaborative arrangements through which firms combine their individual offerings into a coherent, customer-facing solution" (Adner, 2006, p. 2).

Bason (2018) argues that, in order to build an innovation ecosystem, the public sector needs to develop innovation consciousness by creating a common understanding and awareness of the meaning and importance of innovation. Furthermore, it requires creating an innovation landscape in which complex problems can be recognized, innovation is frequently communicated, and common values are created. The public sector needs to build a capacity for innovation by actively involving employees and promoting an innovation culture within the organization. Moreover, the capacity building includes a strong corporate strategy for innovation and considering the political-structural context and framework conditions, such as regulation and legislation. Apart from capacity building, Bason (2018) argues for adopting a human-centered approach by involving citizens and other societal stakeholders in innovation processes. Moreover, an innovation ecosystem requires courage for innovation by leading with a visionary approach, encouraging and managing divergence, and delegating power to citizens and other actors in co-creation processes (Bason, 2018).

The aspects of building an innovation ecosystem suggested by Bason (2028) correspond to key principles of design thinking. Especially the leadership skills and the engagement of citizens and other stakeholders are also highlighted in the Double Diamond framework for innovation (Design Council, 2015). Summing it up, there is an increasing demand and necessity for innovative solutions in public sector organizations. The successful implementation of an appropriate innovation ecosystem supports the elimination of barriers to innovation in the sector. The following section elaborates on the central role of collaborative governance for the public sector's innovation ecosystem.

Towards a Collaborative Approach

According to Torfing and Triantafillou (2016), a shift in governance paradigms towards a more collaborative approach has an impact on the effective realization of public innovation. The following section elaborates on the transition to the *New Public Governance* and the associated *Collaborative Governance* paradigm.

New Public Governance

There are three main governance paradigms that emerged at different points of time in history, not in a sequential but in a complementary manner (Torfing & Triantafillou, 2016). The first paradigm, *Classical Public Administration* (PA)*,* is characterized by an authoritarian and hierarchical manner, rules, and guidelines. The *New Public Management* (NPM) introduced strategic performance management, deregulating approaches, and market logics. The public sector has increasingly oriented towards the private sector by outsourcing services and making use of contracts and competitions (Osborne, 2006). The latest paradigm is the *New Public Governanc*e (NPG), which transformed the public sector towards a more collaborative and interactive governance approach. Osborne (2006) argues that the New Public Governance "combines the strengths of PA and the NPM, by recognizing the legitimacy and interrelatedness of both the policy making and the implementation/service delivery processes" (p. 384). This third paradigm favors more trust-based leadership and management, collaboration with the private sector and citizens, and public sector innovation (Torfing & Triantafillou, 2016).

The Collaborative Governance Paradigm

Within the context of New Public Governance lies the *Collaborative Governance* paradigm which implies close interactions, negotiation, and network management on a highly trustworthy basis within, for instance, public-private partnerships (Warsen et al., 2020).

Ansell and Gash (2008) describe collaborative governance as a strategy of governing "where one or more public agencies directly engage non-state stakeholders in a collaborative decision-making process that is formal, consensus-oriented, and deliberative and that aims to make or implement public policy or manage public programs or assets" (p. 544). The authors claim that this governance strategy emerged from previous failures in governance, such as disappointments in downstream implementations as well as the politicization of regulation. Also, more specialized and distributed knowledge and the increase of complexity and interdependence of institutional infrastructures make collaborations necessary. Ansell and Gash (2008) argue that public-private partnerships and collaborative governance might in some cases refer to the same phenomenon. However, the authors draw a distinction between these two terms on the basis of their different cores. They describe *decision making* as the fundamental principle of collaborative governance, which might be included in PPPs, but is not necessarily their core.

For Thomson and Perry (2006), the *decision making* aspect also takes a central role in their understanding of collaborative governance. They identify collaborative governance as one of five key dimensions of collaboration processes. In their established Multidimensional Model of Collaboration,

the collaborative governance dimension includes joint decision making and joint establishment of administrative structures and agreements within a collaboration.

Scott and Thomas (2017) describe collaborative governance as “a collection of strategic tools for achieving policy goals” (p. 194). Accordingly, collaborative governance might increase the quality of policy outcomes by incorporating required knowledge and competencies from outside of the public organization. Furthermore, the authors propose that collaborative actions might increase the legitimacy of government actions by including actors that are directly affected by these actions and actors that have a good reputation in the respective network. Collaborative governance also helps public organizations to expand their efforts to a relevant scope to reach economies of scale. Moreover, the authors propose that collaborative governance might enable issue diversification by facilitating different intervention types (Scott & Thomas, 2007).

An Integrated Framework for Collaborative Governance

Building on previous research in the field, Emerson et al. (2012) provide an integrated framework for collaborative governance. The researchers describe their framework as a “broad conceptual map for situating and exploring components of cross-boundary governance systems that range from policy or program-based intergovernmental cooperation to place-based regional collaboration with nongovernmental stakeholders to public-private partnerships” (Emerson et al., 2012, p. 1). In comparison to definitions provided by Ansell and Gash (2008), and Thomson and Perry (2006), which are limited to decision making and negotiation aspects, Emerson et al. (2012) come up with a broader definition. The researchers define collaborative governance as:

> The processes and structures of public policy decision making and management that engage people constructively across the boundaries of public agencies, levels of government, and/or the public, private and civic spheres in order to carry out a public purpose that could not otherwise be accomplished. (Emerson et al. 2012, p. 2)

Furthermore, the established framework encompasses concepts from various fields, such as conflict resolution, environmental management and public administration, and integrates several diverse components of collaborative governance. Therefore, their broad and inclusive understanding of collaborative governance ensures that the framework can be applied across different settings, sectors, and processes (Emerson et al., 2012). Their integrated framework for collaborative governance consists of three main dimensions: the system context, collaborative governance regime (CGR), and the collaborative dynamics and actions (see Figure 7).

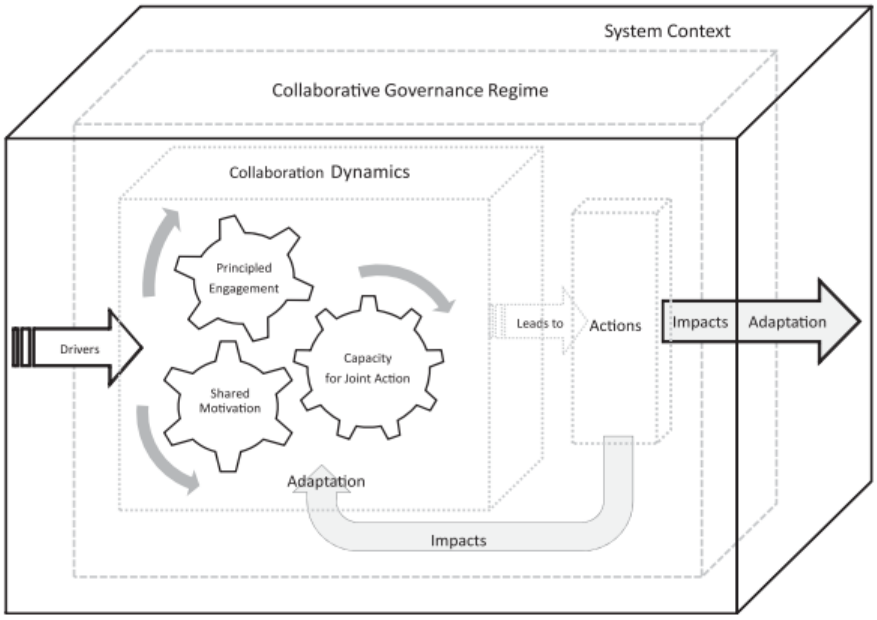


Figure 7: The Integrated Framework for Collaborative Governance. From Emerson et al. (2012, p. 6).

The System Context. The outermost dimension, the *system context,* consists of socioeconomic, environmental, legal, and political influences and opportunities from which several drivers, but also constraints emerge. The authors identify and assign the following aspects of the system context that influence the CGR: resource conditions, policy legal frameworks, prior failure to address issues, political dynamics and power relations, network connectedness, levels of conflict and trust, socioeconomic and cultural health, as well as diversity (Emerson et al., 2012).

Emerson et al. (2012) identify four main elements as *drivers* for the collaboration. The first driving element, leadership, emphasizes the necessity to identify a leader either from one of the parties or from an independent entity who initiates, secures resources, and supports the CGR. The second type of driving elements are consequential incentives such as problems, opportunities, interests, needs of resources, or external drivers like threats/opportunities and institutional or situational crises. Interdependence, as the third driving element is the conviction of the individual entities that they cannot solve the respective issue on their own. The last driving element, uncertainty, is related to the unpredictability and complexity of the influences stemming from the system context (Emerson et al., 2012).

The Collaborative Governance Regime. The *collaborative governance regime (CGR)* encompasses the *collaborative dynamics* and *actions*. The collaborative dynamics dimension, which is characterized by iteration, consists of three interrelated components. The first component is de-

scribed as *principled engagement* which is reached by identifying and including all entities and stakeholders and clarifying their roles. Furthermore, the actors need to develop a shared understanding, values, objectives, targets, and an agenda for the collaboration. The second component, s*hared motivation* includes the building of mutual trust, commitment, legitimacy, and mutual understanding. Emerson et al. (2012) describe the third component as *capacity for joint action*, that needs to be generated before and strengthened throughout the collaboration through inter- and intraorganizational institutional and procedural arrangements. Those arrangements could include decision rules, operating protocols, informal norms, leadership roles, resource sharing and allocation, as well as the sharing and generating of new knowledge (Emerson et al. 2012).

The interaction of principled engagement, shared motivation, and capacity for joint action leads to *collaborative actions*. Actions might be implemented by all partners together or by individual actors. Other external actors, who have not been part of the collaborative process, might also take actions derived from recommendations provided by partners of the collaborative governance regime (Emerson et al., 2012).

Impacts and Adaptations. The collaborative actions of the CGR lead to *impacts* and *adaptations*. Emerson et al. (2012) argue that impacts aim to adjust pre-existing circumstances in the system context, whereas *adaptations* could occur in the form of changes in the collaboration dynamics and the system context. The authors suggest that the "CGRs will be more sustainable over time when they adapt to the nature and level of impacts resulting from their joint actions" (Emerson et al., 2012, p. 19).

Emerson et al. (2012) indicate that the framework and the resulting propositions and suggestions need further validation by future research. Future research would need to determine which relationships in the framework are most relevant in different contexts. Furthermore, they assume that the framework would benefit from a critical application to collaborative governance examples, and they encourage the application of the framework in a variety of different policy arenas, scales, and complexity levels.

Summary of the Theoretical and Conceptual Framework

The following summarizes the main aspects that were discussed in this section so far. Innovation can be regarded from three different dimensions: as an outcome, as a process, and as a mindset (Crossan & Apaydin, 2010; Kahn, 2018). The outcome of innovation appears in different forms, and

on a different level of magnitude (Crossan & Apaysdin, 2019). The innovation process can be distinguished into four main iterative process stages – idea generation, selection, implementation, and diffusion (Eggers & Singh, 2009). Moreover, innovation is favored by adopting an innovative mindset which can be built on courage to innovate, behavioral and cognitive skills, as well as cross-functional and design thinking (Dyer et al., 2011; Kahn, 2018). Built on design thinking principles, the Double Diamond framework for innovation (Design Council, 2015) combines the innovation process with the innovator's mindset by enriching the four innovation process phases with the divergent and convergent thinking condition and four key principles for problem-solving. Innovation in the public sector increasingly appears to be a necessity and is driven by several socioeconomic, political, and environmental factors. However, there are also certain barriers associated with the public sector that hinder or slow down innovative processes. Building the right innovation ecosystem can help in overcoming these barriers (Bason, 2018).

The development towards the New Public Governance (Osborne, 2006) does also contribute to enhancing public sector innovation. It allows for and pushes the public sector into the direction of more collaborative actions through the collaborative governance paradigm. This governance paradigm implies collaborative decision making (Ansell & Gash, 2008), joint establishment of administrative structures and agreements (Thomson & Perry, 2006), and the management within a collaboration (Emerson et al., 2012). The integrated framework for collaborative governance by Emerson et al. (2012) consolidates the premises of collaboration.

Analytical Framework

Our analytical framework consolidates what has been examined and discussed before in the theoretical and conceptual framework and draws the connection to our research question. The analytical framework is used in the initial stages of our analysis, mainly serving as the guiding template for our coding framework.

Combining Frameworks

Taking the suggestion for future research by Emerson et al. (2012) into account, this master thesis applies their framework to the context of PPIs in the waste management sector. However, since the framework proposed by Emerson et al. (2012) does not specifically include the aspect of innovation, we argue that it would benefit from incorporating the Design Council's (2015) Double Diamond framework for innovation. Combining the two frameworks builds the analytical framework for the initial stages of our analysis.

In our analytical framework (see Figure 8), we position the Double Diamond within the *collaborative actions* dimensions. While the *collaborative actions* dimension overlaps with all the stages of the Double Diamond as it represents the actual innovation facilitation and delivery, the *collaborative dynamics* dimension relates mainly to the first two stages of the Double Diamond – that is *discover* and *define*. For instance, leadership skills and engagement principles are both highlighted in the Double Diamond as well as represented in the two components *capacity for joint action* and *principled engagement* of the integrated framework for collaborative governance. Furthermore, the Double Diamond's principles of communication, collaboration, and co-creation are also central components in the framework by Emerson et al. (2012) for *principled engagement*, building the right *capacity for joint actions,* and ensuring a *shared motivation.* Moreover, as already highlighted by Emerson et al. (2012), the *collaborative dynamics* and the *collaborative actions* are highly interrelated. Embedding the Double Diamond into the integrated framework for collaborative governance thus further highlights their connection and the iterative nature of the innovation process emphasizes the back and forth between the two dimensions.

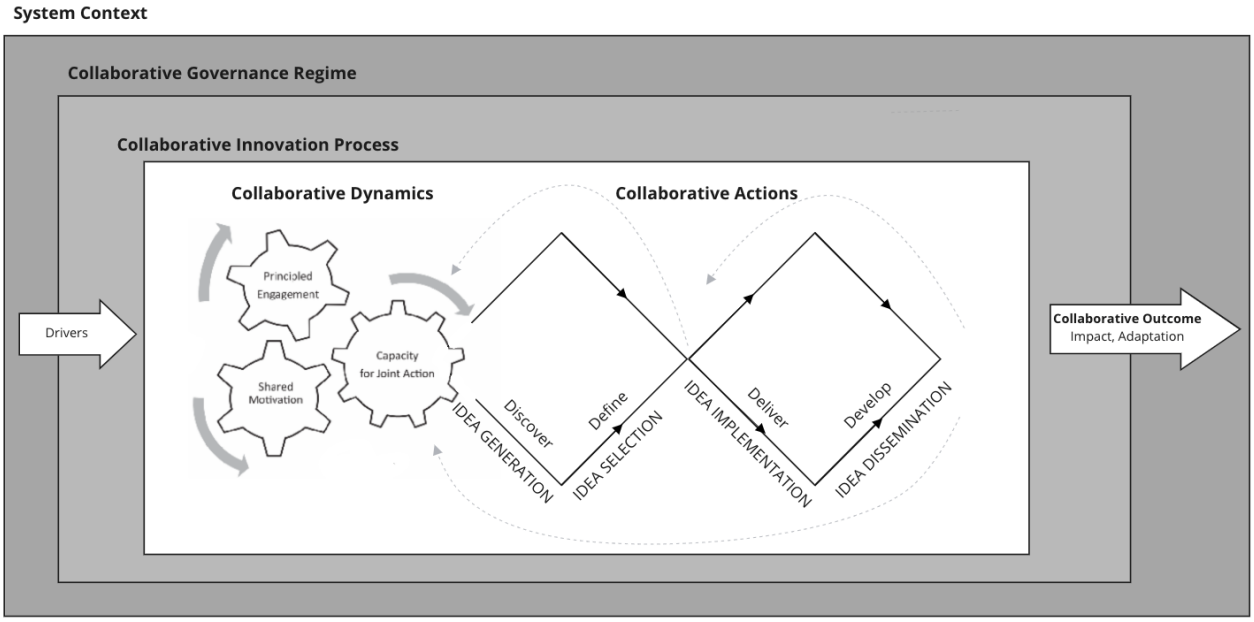


Figure 8: The Analytical Framework. Adapted from Emerson et al. (2012, p. 6) and Design Council (2015).

Applying the Analytical Framework

As previously mentioned, the combined framework serves as a guiding template for our coding framework (see p. 130 of Appendix A), thus providing a tool for organizing our data and identifying the underlying themes. Applying the framework to our case study, we regard the innovation organization platform Circular Copenhagen and its mandate to establish innovation partnerships as the *collaborative governance regime*. In the *collaborative dynamics and actions* dimension, we look specifically into the different projects and innovation partnerships CC undertakes.

As depicted in Figure 8, the *collaborative dynamics* lead into the initial stages of the *actions* in the collaborative innovation process. In our case study, the *system context*, which overarches the other dimensions, represents the legal and regulatory framework in Copenhagen regarding waste management, influences from the European Union, politics, as well as the current Covid-19 pandemic. The *drivers* in our case study represent the preconditions before the partners enter the actual innovation partnership, such as previous experiences of collaborating with each other, an understanding of interdependence, societal and environmental challenges and trends. We regard innovative outcomes, possible future steps, and the lessons learned as the *collaborative outcomes* of each innovation partnership.

Analysis

The following section depicts the four layers of our analysis, leading to the main recommendations for how to design public-private innovation partnerships. In the first layer, we describe and explore the thematic networks identified within the semi-structured interviews with partners from the three PPIs. In the second layer, we highlight the differences between the studied partnerships, outside of the constructed thematic networks. In the third layer, we describe our data from the expert interviews in relation to the constructed thematic networks, identifying the similarities and differences between the expert input and findings from the PPIs. In the fourth layer, we compare our findings from all the interviewees with the reviewed literature and concepts. On those bases, we introduce a PPI framework consisting of factors that impact the innovative outcomes of PPIs.

Thematic Networks

Following Attride-Stirling's (2001) approach as described in the *Methodology* section, basic, organizing, and global themes are identified based on their frequent occurrence in the partnership interviews and their perceived importance by the interviewees. The following section presents the resulting thematic networks, each of them having a global theme at its core, deriving from the organizing themes which build on the lower-level basic themes. In total, we identify seven global themes: human-centeredness, diversity, learning, alignment, interaction, resources, and legal and regulatory context. Despite the identified clusters, all the themes are interrelated and mutually influencing each other.

Human-Centeredness

The global theme human-centeredness encompasses five related organizing themes: societal trends, co-creation, dependency on users/citizens, external communication about the partnership, and the public sector's role in communication (see Figure 9).

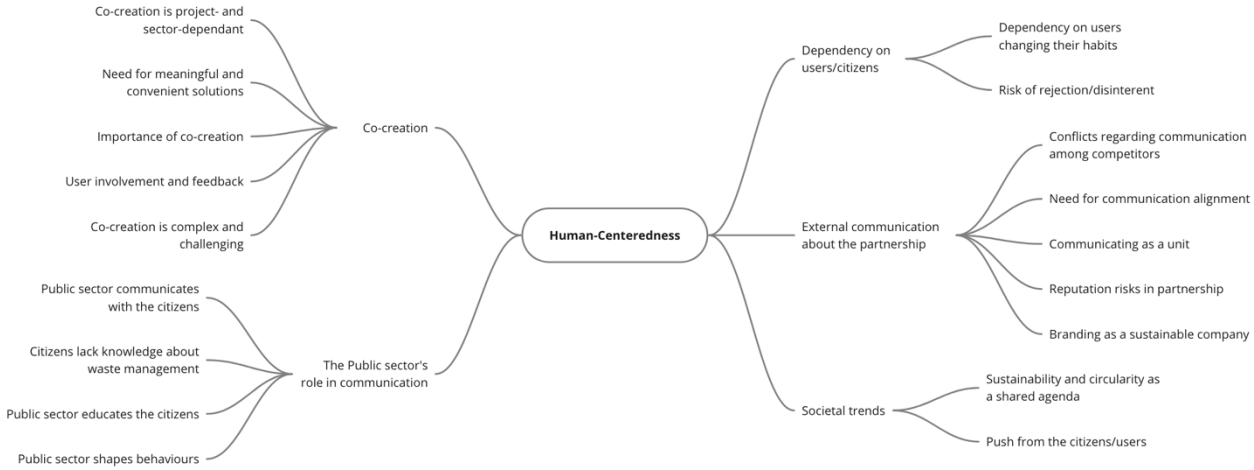


Figure 9: Thematic Network of Human-Centeredness. Own illustration

Societal Trends. The importance of a human-centered approach in PPIs in the waste management sector becomes apparent with regard to ongoing movements and trends. Interviewees from all three partnerships emphasize the increasing relevance of sustainability in society. The Danish society is perceived to put a high-level focus on sustainability, with citizens having a growing sense of responsibility for their waste and a desire to reuse resources and materials. The citizens' increasing interest for responsible treatment of resources is perceived as a push for the partners to really engage in this matter, as described by one of the partners: "We know that plastics specifically in sort of the packaging category is something that they want us to work on the most" (Coop Danmark, 2021, p. 113 of Appendix B).

Co-Creation. Several interviewees emphasize the need to get user feedback through, for instance, workshops and interviews, and to understand their needs. It is further emphasized that the sociodemographic differences between countries and regions would need to be considered in order to fully understand the user. Moreover, the importance of designing a solution that is meaningful and convenient for them is recognized to be important: "Always create something that is convenient for the users, always create something from a user perspective that makes sense" (Novo Nordisk, 2021, p. 237 of Appendix B).

However, the degree of actively involving citizens and users through co-creation seems to be project-dependent. The public sector interviewee notes: "[The citizens] could be a more integral part of the actual development activities. And that would definitely make sense sometimes. But I don't think all of the time" (Circular Copenhagen [CC], 2021a, p. 47 of Appendix B). Another partner argues that the degree of co-creation depends on the sector and is rather low in the waste management sector. Despite the recognized importance of co-creation, the interviewees find the associated complexity

and its time-consuming nature to pose a potential barrier to an extended user and citizen involvement. This is emphasized by the public sector representative:

> I know that is kind of a rule that we should also involve citizens and co-creation, but the reality is that a lot of this is very complicated actually. Both in terms of technology and the systems for collecting and recycling. (CC, 2021a, p. 47 of Appendix B)

Dependency on Users/Citizens. Beyond the reported importance of a human-centered approach in general, the interviews show that the feasibility of some PPIs could be critically dependent on the users. For instance, the Returpen initiative is perceived as highly dependent on the citizens' willingness to return their used insulin pens to the pharmacy and the partners point out the risk of the users rejecting the take-back system. Hence, the convenience of the solution for the user gains further importance: "It had been made so easy for them to return their pens. That's very important. If it was too difficult, then no one will have done it" (Diabetesforeningen, 2021, p. 174 of Appendix B). Furthermore, the public sector representative highlights the role of citizen waste sorting habits in waste management development: "The main issue is actually that most of the plastic waste is not even collected because citizens don't sort it" (Circular Copenhagen [CC], 2021d, p. 98 of Appendix B).

External Communication about the Partnership. Following a human-centered approach also includes external communication about the partnership towards the citizens. However, the interviews reveal that external communication about the innovation partnerships is often used also as part of the actors' sustainability branding strategies. The public sector interviewee notes that some private partners join a partnership for "telling the story to their customers and getting some concrete input as to what they can do in order to have a more green impact" (CC, 2021d, p. 91 of Appendix B). Another partner further emphasizes that communicating an environmentally responsible strategy is also important to attract new employees and investors.

With regard to the external communication of the partnerships, the importance of communicating as a joint unit becomes apparent in a comment by one of the partners: "You want to speak as a unit, as a partnership, instead of just each individual stakeholder in the partnership, it makes a lot more sense, it has bigger impact as well" (CC, 2021d, p. 92 of Appendix B). However, external communication conflicts might arise in the form of rivalry for media attention, especially among direct competitors within a partnership. Therefore, the interviewees emphasize that external communication needs to be regulated and aligned among all the partners to avoid conflicts.

The Public Sector's Role in Communication. The public sector seems to have a special role in terms of communication towards the citizens. The partners note that public sector communication has the power to educate citizens about waste management and thus change their waste sorting habits. Seen from the public sector's point of view, citizens often lack knowledge about how their waste is treated: "There's a lack of belief that plastic waste is actually recyclable [...] And also, there's a lack of knowledge about what happens to the plastic waste that you put into the waste" (CC, 2021d, p. 97 of Appendix B). For example, in Copenhagen, citizens are invited to visit the municipality's test sorting facilities, incineration plants, and recycling centers where they can engage in a dialogue about waste treatment and see what is technologically feasible.

Conclusion. The global theme human-centeredness highlights the importance of a focus on citizens/users, either through direct involvement or external communication. Furthermore, it emphasizes the essential role of societal trends in establishing and developing PPIs. The thematic network also shows the role of the public sector in educating the citizens about waste management, possibly influencing their waste sorting habits and views on the topic.

Multidisciplinarity

Having a multidisciplinary collaboration seems to be a key enabler for innovation and success in all three partnerships. The global theme is divided into three organizing themes: involving all stakeholders, differences between the public and private sectors, and interdependence (see Figure 10).

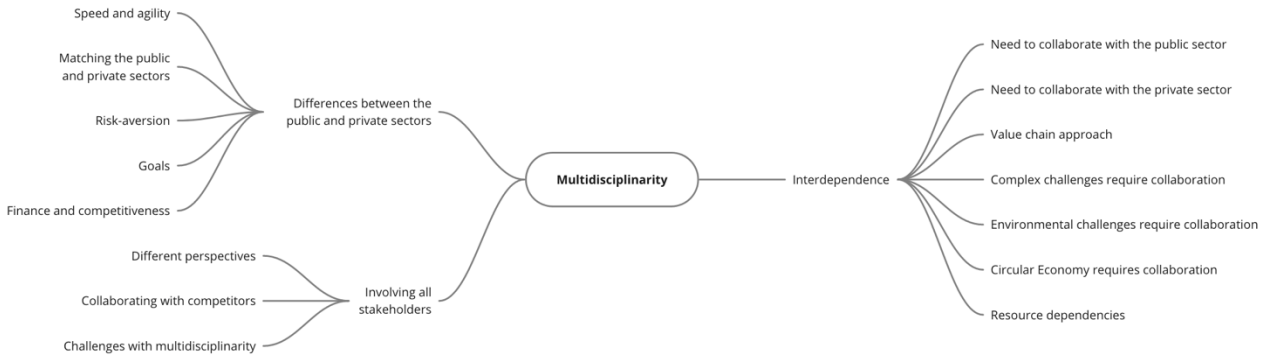


Figure 10: Thematic Network of Multidisciplinarity. Own illustration.

Involving all Stakeholders. The interviewees stress the importance of involving different stakeholders in the innovation process. Some partners point out the benefits of learning from each other and understanding the challenge from different perspectives. Having a broader perspective on the challenge is seen as a critical success factor. Other partners acknowledge this argument, stating that their partnership would benefit from including even more collaborators with various points of

view, even outside of the existing value chains. However, the partners also highlight the increased complexity of a multidisciplinary approach: “I think it could have been interesting to have someone with a different view, with a different expertise in the group, but then it would really have taken a long time to do this project” (Amager Ressourcecenter [ARC], 2021, p. 36 of Appendix B). Nevertheless, the partners do not perceive the complexity of multidisciplinary collaboration to be an obstacle as it is outweighed by the benefits of diversity.

Another inherent characteristic of multidisciplinarity are the differences in focus and objectives of the actors due to the nature of their core businesses. One of the interviewees addresses this issue by stating that:

> We produce technology. And we basically do business to business. On the other hand, at the end of the food chain, they are selling foodstuff. But there's a very long way between us, we are very far apart. So you can say, therefore, there are not that many mutual common grounds. It's difficult, such a network. (IHP Systems, 2021, p. 197 of Appendix B)

However, despite the existing differences, the interviewees emphasize that the partners share an overall common ground stemming from a shared sense of social responsibility.

Involving all stakeholders in the process might also implicate collaboration with competitors. According to the interviewees, including competitors might be beneficial to increase the resource capacity, reach more users, and get a deeper understanding of the specific part of the value chain. Joining forces with competitors might be necessary especially for scaling up pilot projects. However, including competitors is also described as being a challenge since the competing partners have to carefully consider which insights to share in the partnership to keep their competitive advantage and might, therefore, be more reluctant to share knowledge.

Differences between the Public and Private Sectors. Alongside the inherent differences between various stakeholders, the contrasts between the public and private sectors are a recurring theme throughout the interviews. First of all, interviewees recognize differences between the two sectors in terms of their goals. Since the public sector pursues political and societal goals, they are perceived as less biased by some of the interviewees. The private sector, on the other hand, is mostly driven by profits, leading several interviewees to the assumption that some private actors might join such a partnership for self-promoting reasons rather than the common good.

The interviewees see the public sector's risk-aversion, compared to the private sector, as a barrier to innovative outcomes. Nevertheless, Circular Copenhagen as a public organization is described to be an exception, as stated by one of the interviewees:

> They were prepared to take a risk and try a technology that has never been used before and that needs to be developed a bit. So from my end, I think […] they were prepared to take a big risk and that is one of the main drivers and one of the success keys for this project. (IHP Systems, 2021, p. 195 of Appendix B)

Other recurring differences between the two sectors regard agility and decision-making processes. The private sector is described to act faster and more agile than the public sector. This difference is further emphasized by the bureaucratic nature of the public sector. Since the differences can lead to tensions throughout the process, the public sector representative explains that both sectors need to adapt to each other's ways of working: "It's both, the public party that needs to develop new ways of working where you can be more flexible but it's also the private partners who need to understand the reality of public funding and political organizations" (CC, 2021a, p. 51 of Appendix B).

Despite the perceived differences between the public and private sectors, the interviewees see a huge benefit in matching the skills and characteristics of both sectors, as stated by one of the partners:

> I think that you have different kinds of skills. If you're sitting in the municipalities, the public, or if you're sitting in the private. And if you combine these different competencies, you actually learn and have benefit from both because they gave some information. (Distribution Denmark, 2021, p. 190 of Appendix B)

Interdependence. Not only do partners perceive the benefits of matching the public and the private sectors, but they also see it as a necessity and recognize the interdependence among the partners. Seen from the public sector's point of view, there is a need for the private sector to collaborate with the municipality in order to create tailor-made solutions:

> For instance, plastic waste management in Copenhagen is different from plastic waste management in other cities even though it's quite similar…we want a tailor-made solution. Specifically made for the Copenhagen context. And that you can't do without involving the customer in the innovation process. (CC, 2021a, p. 50 of Appendix B)

This line of thought is also shared by the private sector: “Since the public sector in Denmark plays a very important role on the [waste management] infrastructure, they should also be part of the solution” (Novo Nordisk, 2021, p. 226 of Appendix B). Furthermore, for the public sector, collaborating with the private sector is seen as necessary to adopt new ways of thinking*:*

> We also wish to engage with the industry and to have a [...] running basis of inputs as to how we can think things differently and how we can try to spur innovation and make us to do things completely differently than what we have done because we know that […] we won't make the transition for circular economy using the same type of thinking which kind of brought us into the situation where we are now – we do create a lot of waste. (CC, 2021a, p. 41 of Appendix B)

On a broader level, the interdependence transpires in the shared opinion that complex challenges, such as reaching sustainability, require collaboration between the different sectors and multiple disciplines. In that sense, collaborating with the private sector helps the municipality to reach their political goals addressing societal and environmental challenges. Especially circular economy requires collaboration along the whole value chain in order to make a real impact:

> There are a lot of issues that we're having, for instance, within environmental challenges that we see, but also in other areas which cannot really be solved just by us buying some service from another company, which really need a lot of value chain actors to come together and talk and jointly develop a solution which is good for everyone. Because if they don't do that, the problem just tends to go away from one part of the value chain and then emerge in some other part of the value chain. (CC, 2021a, pp. 50-51 of Appendix B)

The partners also acknowledge the mutual dependency of the two sectors in relation to resources. The public sector is contingent on the private sector’s co-financing as well as human resources, know-how, and technical equipment. “They have so much money that they can actually drive such a process. [...] So if Novo Nordisk haven't done that, there would have been no Returpen project,” (Diabetesforeningen, 2021, p. 173 of Appendix B) describes one of the interviewees. Specifically in the waste management sector, the private sector’s resources can relieve the public budget for collection and recycling the waste as the interviewee from the municipality describes:

> If we were to set up different separate collection schemes for all different parts of the waste stream, it would be very, very expensive for the citizens. Very expensive. And probably not reasonable. So that's why some of the, you know, the minor fractions where the companies actually do see a potential business case in putting up a take back scheme and where they

> hold the expenses for collection and recycling, I mean, that's a good thing. I mean, we support it. That the private companies also, you know, take responsibility for their own waste production. (Circular Copenhagen [CC], 2021c, pp. 74-75 of Appendix B)

Particularly in the waste management context, the interviewees emphasized the municipality's knowledge and understanding of different waste streams and collection schemes as an essential resource. Furthermore, as the development of solutions for waste management is dependent on waste material, private actors operating in the sector benefit from accessing the municipal waste. In driving PPIs, the public sector's resources in form of time and manpower are also highlighted as a necessity.

Conclusion. The inherent differences between the stakeholders, and specifically between the two sectors, might bring challenges to the PPI process. However, their distinctive characteristics can complement each other in the innovation development process. Furthermore, the partners depend on each other in developing successful solutions and solving the underlying environmental and societal challenges.

Learning

Learning is identified as another global theme. It consists of five organizing themes, which are: experimentation, knowledge sharing outcomes and processes, applying the knowledge from the innovation partnerships in the future, and different forms of innovative outcomes (see Figure 11).

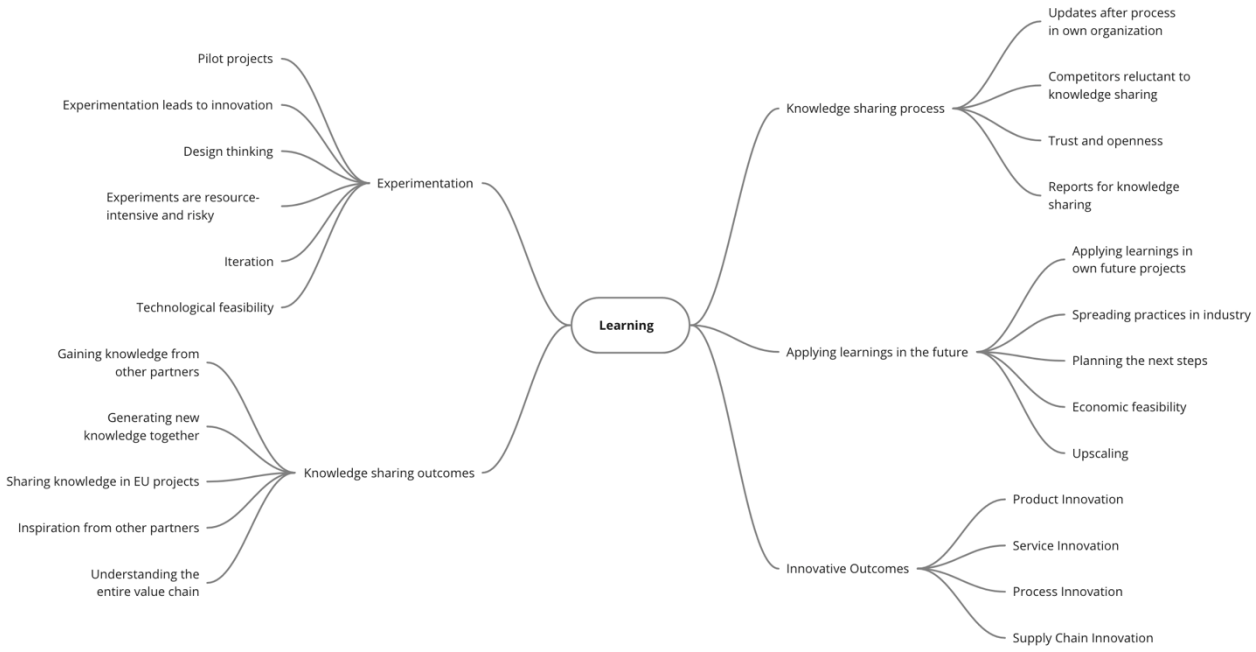


Figure 11: Thematic Network of Learning. Own illustration.

Experimentation. The core of all three partnerships are pilot projects, which involve experimentation, testing, and demonstrating. Pilot projects are described to spark new inspirations, increase partners' confidence through incremental success and provide a good opportunity to develop and test new solutions that are not on the market yet. The high degree of experimentation in the pilot projects is associated with iteration within the innovation process. Although some partners describe the overall process as linear, all of the partners perceive the smaller steps of the collaborative processes to be highly iterative. The interviewees emphasize that one should not be afraid to fail and they highlight the learnings that derive from failures. The public sector representative sees design thinking in this context as a helpful mindset: "[It's] a way of approaching complex problems where you actually do something along the way and then you kind of adjust along the way according to the learnings that you get. So it's a way of pushing forward" (CC, 2021d, p. 106 of Appendix B).

The interviewees emphasize the importance of sharing smaller results along the experimentation process not only among all the partners but also with the end-users. As an example, the partners of the Returpen partnership collaborated with design companies that created lamps and chairs from the recycled insulin pen materials in order to provide the user with viable examples. However, experimentation might also come with high costs and a need for additional resources, especially in connection to testing new technologies. Moreover, the partners associate experimentation with taking a risk of spending too much time and resources without achieving a reasonable and innovative solution.

Knowledge Sharing Process. Active knowledge sharing among the partners is an important aspect of the process. Several interviewees associate knowledge sharing with a high level of trust and openness. Regular meetings were used to update the other partners and share new knowledge and findings with each other. The individual partners were mostly doing their share of the process within their own organization, and informing and updating the other partners about their progress to receive feedback. However, some partners curiously followed all the steps of the other partners:

> I was visiting Copenhagen several times to see what happens in these different steps, how they work with them. [...] And in that step or process, I was also a partner, not directly, but again, indirectly, I followed, so I have been able to follow the material through all steps, through the project. (Aage Vestergaard Larsen [AVL], 2021, p. 6 of Appendix B)

Apart from formal reporting, informal dialogues and networking are also perceived as important for knowledge sharing, especially in value chain partnerships. However, some interviewees see the knowledge sharing process as rather challenging when direct competitors are involved in the partnership. One of the partners notes that even though they had a trustful relationship to their direct

competitor in the partnership, they needed to carefully consider which knowledge to share in order to keep their competitive advantage.

Knowledge Sharing Outcomes. Interviewees report that they learned a lot about the other partners' fields of expertise and that they gained new inspirations. As already noted in the context of involving various stakeholders, the partners see it as beneficial to have an as broad perspective on the challenge as possible and an understanding of the whole value chain which can be achieved through active knowledge sharing. One of the interviewees articulates the advantages of knowledge sharing, especially in a multidisciplinary collaboration with different partners from along the value chain:

> I think the main [innovation] enablers were that we represented the entire value chain. So it was very, always very exciting to hear from the others because you get a completely other perspective basically on the same challenge. [...] Then you get a kind of another view on it, which is a bit more...you get a sense of the complexity of the issue. And then you also get a better standpoint for actually managing the issue because you need to understand everyone's concerns and take that into account. (CC, 2021c, p. 89 of Appendix B)

Innovation projects that are part of an EU-funded initiative have another take on knowledge sharing. The objective of EU-funded innovation projects is mostly to share the generated knowledge and solutions among other municipalities and EU regions. One of the FORCE project partners highly values the connection to other municipalities and projects in EU-funded initiatives: "I think, also always interesting to hear what's happening in the other cities and talk to them about that. […] So I've always found that it's a good thing to be able to make collaboration in such projects" (Dansk Teknologisk Institut [DTI], 2021, p. 152 of Appendix B). However, since EU-funded projects incorporate the obligation of knowledge sharing, they require thorough documentation, additional time, and willingness for increased transparency among the partners. Interviewees perceive this obligation for knowledge sharing and the resulting additional workload to be a potential barrier for private companies to take part in EU-funded projects.

Applying Learnings in the Future. In all three partnerships, the projects were run as pilots and all interviewees agree that they should be upscaled. In this regard, one of the interviewees notes: "The problem with many innovation projects is that we managed to show that something is possible, but it's the scaling up and the commercialization of the activity that sometimes is not taking place" (ARC, 2021, p. 33 of Appendix B). The partners argue that upscaling requires collaborating with even more stakeholders, municipalities, and competitors. Moreover, upscaling might also require new waste reforms and legislation. Furthermore, the partners note that once the technological

feasibility is demonstrated, the economic viability of the innovative solutions needs to be proven as well. Turning the pilot project into a positive business case requires patience as well as additional financial and infrastructural resources to reach economies of scale.

Various partners are very positive about spreading the practice within the industry. The innovation partnerships are regarded as demonstration projects that push other organizations in the respective industry towards further development of solutions for recycling and circular economy. The learnings from the partnerships are also transferred to the partners' own organizations where they apply them in other projects. Furthermore, some interviewees report that the relationship-building during the innovation partnerships generates new collaborations for other following projects: "So as a result of the first pilot, we actually already also took another project together [...] We simply couldn't just stand still after the first pilot with the pen" (Distribution Denmark, 2021, pp. 186-187 of Appendix B).

Innovative Outcomes. Within the partnerships, interviewees identify different innovative outcomes. The partners perceive the technological feasibility and the way they collaborated with each other as the most innovative outcomes. In terms of the innovative outcomes of one of the partnerships, an interviewee explains: "The technical innovation comes from IHP and Fearch. But then, the main innovation here is probably the organizational innovation where you have the partners actually talking together and closing the loop instead of it just happening in separate steps" (Circular Copenhagen [CC], 2021b, p. 57 of Appendix B).

Conclusion. Iteration is an essential part of the innovation process within PPIs. The shared and generated knowledge within the collaborative process is not only leading to innovative solutions but it also enables future innovation projects. After a pilot project, it is necessary to prove the innovative solution's economic feasibility and to upscale the project. Besides the technological feasibility of a solution, collaboration along the value chain is considered to be an innovation in itself.

Alignment

Building common ground, mutual understanding, and aligning the partnership internally with the partners' own organizations are identified as critical aspects in the innovation partnerships. They represent the three organizing themes that fall under the global theme of alignment (see Figure 12).

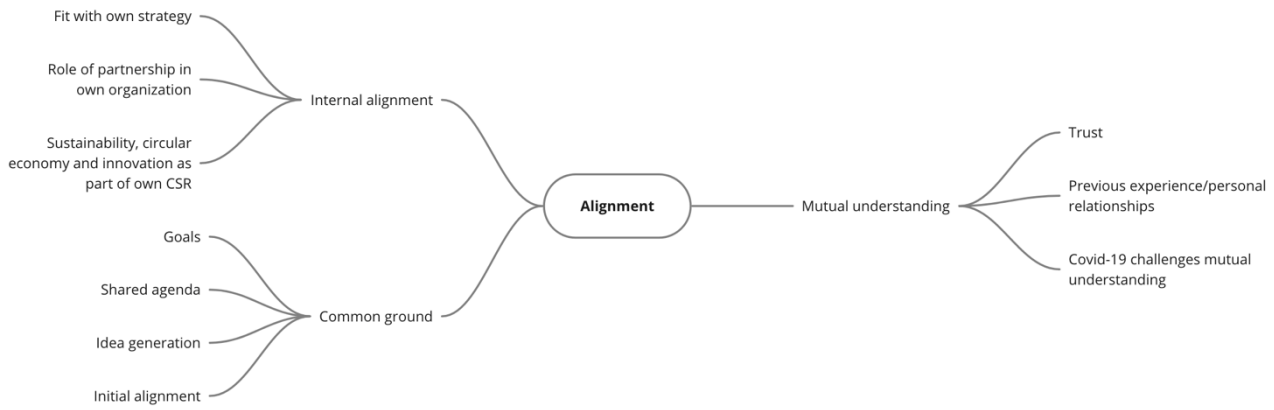


Figure 12: Thematic Network of Alignment. Own illustration.

Common Ground. The interviewees see it as important to dedicate time at the beginning of the process to align and coordinate between the partners:

> Normally you really want to just move forward. And in the beginning, you think, oh, it takes a lot of time, all these coordinations, all this alignment. [...] But it was actually a big, big part of the success from my side that we coordinated, we align, we communicate […] So we were on the same page, so to speak, all the time […] So spend this time in the very beginning because you save much more time afterwards in the project. (Distribution Denmark, 2021, p. 185 of Appendix B)

Initial workshops and meetings were executed at the beginning of the process to clarify each other's roles and resource contributions. However, since the initial agreements cannot predict every future scenario, constant alignment throughout the process is necessary. Apart from agreements on roles, responsibilities and resources, the partners argue that the development of shared goals and visions in the very beginning is essential. The interviewees see several benefits for building the agenda together, such as that it ensures commitment, motivates engagement in the project, or saves time later in the project. Despite the common vision in all the projects, most interviewees point out that the different goals of the partners were still evident, as previously mentioned in connection to the drawbacks of multidisciplinarity. Therefore, to establish a common ground, the interviewees explain that it is important to understand their partners' intentions and reasons for joining the collaboration and to comprehend their different ways of working in their day-to-day business.

Interviewees articulate the importance of establishing a non-binding manifesto or agreement about the vision of the partnership which is separated from the contract:

> We developed two documents, it was one, a memorandum of understanding. And that's just a document we do with what do we exactly intend to do and we would like to use resources on it. And what are we allowed to share and some of these things. [...] And then we made a core story, a core story meaning what is it exactly we are tapping into, what is the problem we are trying to solve [...] So that was kind of a framing of that collaboration, the partnership. (Novo Nordisk, 2021, pp. 221-222 of Appendix B)

Mutual Understanding. Several interviewees emphasize the importance of trust in a collaborative process. Being open and transparent is seen as a prerequisite for trust building. According to one of the partners, trust is achieved faster through a non-binding manifesto of joint goals and vision rather than a complex legal agreement as described in the previous paragraph. Many partners complain that building trust in the Covid-19 pandemic is hindered by the lack of face-to-face interactions: “Especially when you need to collaborate with external stakeholders you need to build up some level of trust and that's not what we would do just by looking at each other through the screen” (CC, 2021a, p. 41 of Appendix B).

Many partners make it clear that collaboration and trust building become much easier when the collaborators know each other from previous projects. They mention the associated feeling of safety as well as the expectation of successful project outcome. In all three partnerships, many of the interviewees are either regular business partners or part of the same networks. Some partners have previously engaged in several meetings together that sparked ideas for joint projects and some have meetings on a regular basis. On the other hand, one partner points out the risk of falling into a routine of collaborating with the same familiar partners all the time, seeing it as a limitation for diversity as well as a potential barrier to innovation.

Internal Alignment. Apart from the alignment within the innovation partnership, the partners also stress the importance of coordinating and positioning the partnership within their organization. From the interviewees’ narrations, it also becomes apparent that the significance of the innovation partnerships in their respective organizations is different. While some partners have dedicated a whole team from their organization to work on the project, other organizations have only devoted single persons to be involved in the innovation partnership. The partners see communication towards their organizations to be important in raising awareness and creating commitment among their employees:

> Being originally only an incineration plant means that inside our organization, there are also people...well, it has taken some time to understand why we should recycle plastic instead of burning it. So there's also for me the role back in my own organization to make sure that this

is really understood and actually is something we are proud of participating in. (ARC, 2021, p. 28 of Appendix B)

Various interviewees agree that the innovation partnerships benefit from being in line with the individual overall organizational strategies or their corporate social responsibility (CSR) strategies. Another aspect of coordination of the partnership within the organization is transferring and applying the learnings from the partnership in their day-to-day business.

Conclusion. Partners need to create mutual understanding and build trust, which can be accelerated through previous experiences of working together. For the success of the partnership, it is essential to build common ground with a shared agenda and goals, preferably at the beginning of the process. Furthermore, the individual partners should make sure that the project is in line with their organizational strategy and supported by the employees.

Interaction

The global theme interaction is built around the aspects of facilitating innovation partnerships. It includes two organizing themes: organizing and management skills and traits (see Figure 13).

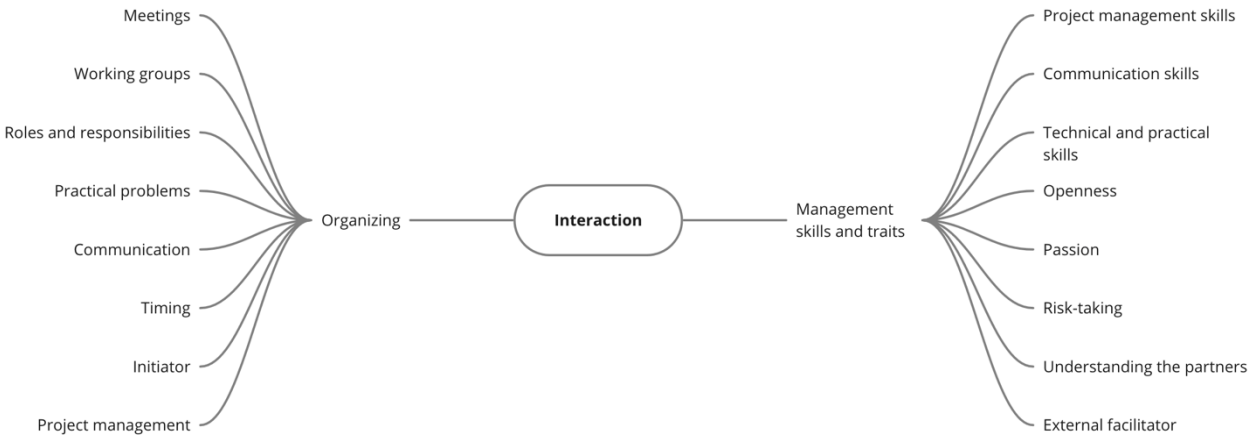


Figure 13: Thematic Network of Interaction. Own illustration.

Organizing. Organizing the collaborative process itself as well as various practicalities is an inherent part of the partnerships. Many of the interviewees point out the importance of having constant communication, updating each other about the process and potential difficulties. All three studied partnerships were organized around regular general meetings and smaller working groups for specific tasks and issues. The division of roles and responsibilities was determined by the partners' roles in the value chain. The interviewees agree that the initiator, who in all the projects took the lead role, plays several roles, and thus bears greater responsibility. The leader is not only in charge of

facilitating the workshops as well as resolving any conflicts but is also in constant bilateral communication with all the partners. Regarding the differences between the leading and participating roles, the public sector representative explains that the municipality appreciates private companies taking the lead:

> It's obviously a lot more work-intensive for us to lead a partnership as to contribute to a partnership. It would be nice actually with more of these external partnerships where we could just contribute and then someone else would be doing our work basically (CC, 2021a, p. 49 of Appendix B).

In terms of organizing, setting deadlines and timeframes is perceived as an essential factor for mobilizing the participants and developing the project. However, the need for adjusting the timeframe along the way due to the unpredictability of the projects is implied: “I think there was, on both those parties, there was a great understanding of – this is a pilot project. This is virgin territory. So it's very difficult to estimate the time period,” (IHP Systems, 2021, p. 205 of Appendix B). The factors slowing down the process, besides the Covid-19 pandemic, were usually issues of technical or practical nature:

> It's very down to the ground practical problem. But often these problems emerge when you start up with, you know, a top vision and then you want to carry it out. And it turns out that it's these down-to-earth problems that are really the challenge. (ARC, 2021, p. 24 of Appendix B)

Management Skills and Traits. Regarding the role of a facilitator or a project manager in PPIs, many interviewees agree that oversight of all the steps, understanding the different tasks and their interdependencies, agility in solving difficulties, and having a certain degree of technical knowledge are essential. Many also put emphasis on listening to all the partners, being open-minded and inclusive, and encouraging a bottom-up approach. Other common themes are clear communication and transparency or *people skills.* In connection to facilitators within the public sector, the need for individuals who are passionate and willing to take a risk is highlighted: “These things are very driven by the passion of individuals. And it's difficult to institutionalize these processes. And that's maybe where it has its weaknesses. So you need passionate people that drive it” (IHP Systems, 2021, p. 200 of Appendix B). The interviewee further argues:

> It's very important that you are prepared to step into virgin territory where nobody has been before. And be ready to fail...if it doesn't work. And be ready that somebody would point fingers at you if it doesn't work. (IHP Systems, 2021, p. 202 of Appendix B)

The public sector representative, who has been in the project manager's position, believes that understanding of the different partners and their reasons for collaboration should serve as a *guiding principle* in the process, to be able *to maneuver* between the differences while ensuring everyone's engagement. Due to the complexity of PPIs, knowledge regarding the legal framework of the partnerships as well as intellectual property rights is important. Furthermore, being able to handle cultural differences and communicate with different people is described as necessary:

> You need to have quite good skills for collaboration and also for understanding technical side of things, because it was very technical about production of plastics and you need to be able to speak with the, you know, the small producers of new plastic items and be able to communicate them with them in a way that makes sense for everyone. (CC, 2021d, p. 103 of Appendix B)

Another extensively discussed trait of the facilitator is being unbiased. One partner, who sees this as perhaps the most important trait in a PPI manager, perceives the municipal facilitator as a neutral actor as well:

> I think that it might be good that there is someone outside these companies from sort of a neutral organization that has role as a project manager. Because he has nothing at stake except that he wants the project to be successful. But he does not have competition, for instance, to take notice of. (ARC, 2021, p. 32 of Appendix B)

Some partners commend the work of external facilitators. On the other hand, the municipal facilitator himself believes that external facilitators often miss the necessary knowledge while the partners often have a lot of knowledge about the rest of the value chain as well: "It's a good idea to have a vested interest because it makes it more powerful, the partnership – as long as you can convince the other partners that you're not doing it only because of your own interests" (CC, 2021d, p. 108 of Appendix B).

Conclusion. To organize the process of PPIs, partners need to define roles and responsibilities, set timeframes, and constantly communicate. For PPIs, the facilitator should be open-minded, have a bottom-up approach, understand the different partners and have oversight of the process. Agility, as well as passion and risk willingness are further favorable characteristics to have. The facilitator should take a neutral position, which is easier for external facilitators.

Resources

The global theme of resources highlights the resource-intensive nature of PPIs and it consists of two organizing themes – financing and other resources (see Figure 14).

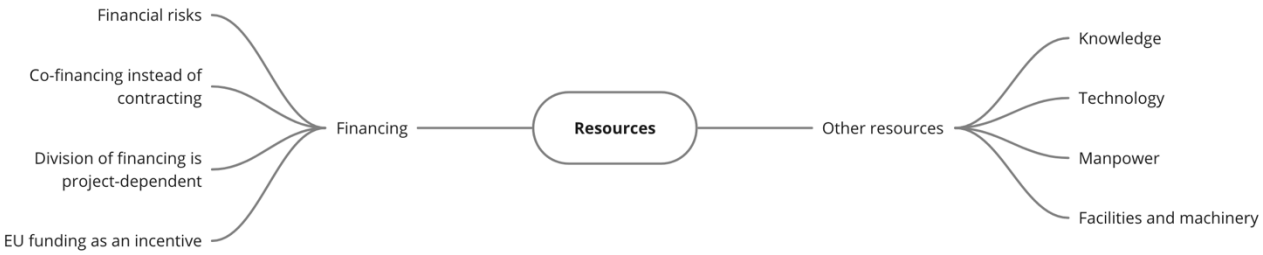


Figure 14: Thematic Network of Resources. Own illustration.

Financing. The interviews show that the division of financing in PPIs is project-dependent, however, the initiator of a partnership is likely to take a higher financial risk than the other partners:

> It's costly to start innovation. And that's maybe one of the biggest risks I'm facing, that's funding, whether we can manage funding and to what extent we will be willing to fund this compared to what are the benefits that people are seeing in this. (Novo Nordisk, 2021, p. 236 of Appendix B)

Although the other partners do not perceive their companies to be taking a lot of financial risks, the interviewees emphasize the need for turning the project into a positive business case: “We are a private company and I have a responsibility that we can take the investment and we will also have the return on that investment. Of course, we cannot just continue to give for free or develop costs” (Distribution Denmark, 2021, p. 188 of Appendix B).

The need for co-financing of the joint innovation development is pointed out as an essential characteristic of PPIs. The public sector representative describes the difficulty with finding partners who are willing to co-finance a project rather than sell their solution:

> We don't buy a product but we co-finance the development activity with external stakeholders who also think that the challenge is worth co-financing. [...] You have to find the joint project where everyone is willing to actually co-finance some of the activities by themselves. (CC, 2021a, p. 46 of Appendix B)

Furthermore, this requirement places SMEs at a disadvantage, compared to larger companies with more financial resources. EU funding, or any third-party funding, is perceived as an incentive for

joining PPIs, especially in technical projects that tend to be rather resource-intensive. However, the application process itself is costly and time-consuming, while the chances of receiving the funds can be quite low. Even though EU funding is seen as an incentive for partners to participate in the projects, it is also perceived by the public actor as generating lesser commitment from the partners than in partnerships where the participants are responsible for the entire investment.

Other Resources. Besides financial resources, the need for other resources differs based on the focus of the project, and the division of which partners bring them in typically depends on the partners' roles in the value chain. In projects focusing on new technologies and the development of technical solutions, the interviewees emphasize technical knowledge and solutions, machinery and new technologies as their main contributions to the project. For a project aimed at developing a waste take-back scheme, logistics and facilities for storing the waste as well as knowledge about the target group of citizens are essential resources.

Conclusion. Initiators of partnerships often take a higher portion of the risks. Nevertheless, all the partners strive for turning the project into a positive business case. PPIs are characterized by a need for co-financing of the joint innovation development. While third-party funding can be an incentive to join a project, it might also result in lower commitment. Apart from financing, other possible resources include technology, knowledge, facilities and logistic capacity.

Legal and Regulatory Context

PPIs need to consider the legal and regulatory context in terms of the municipality's jurisdiction in waste management, PPI agreements among the partners, and the role of the European Union. Those aspects represent the organizing themes of the thematic network (see Figure 15).

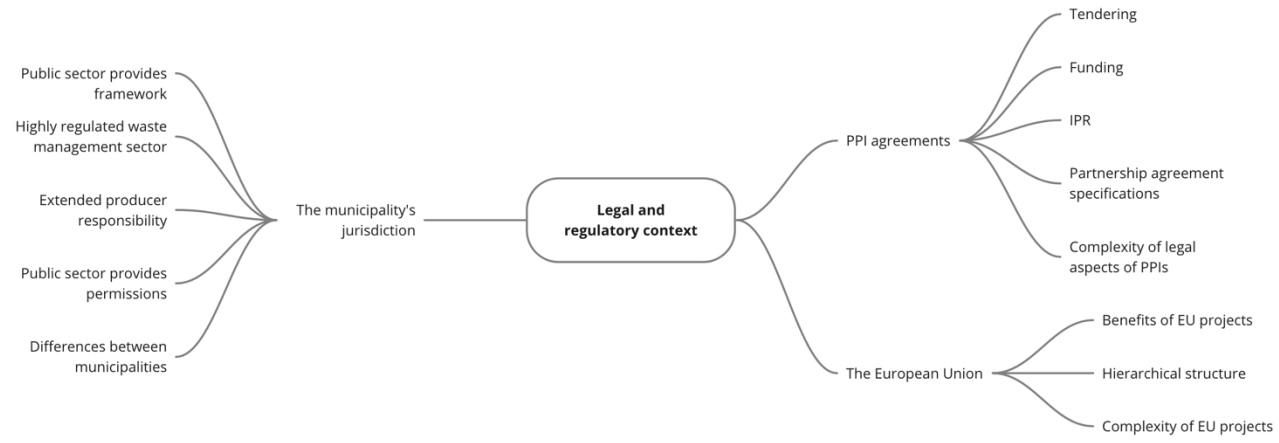


Figure 15: Thematic Network of Legal and Regulatory Context. Own illustration.

The Municipality's Jurisdiction. The partners perceive waste management as a highly regulated and political sector. One of the partners highlights the need for alignment among the municipalities with different waste management systems to allow for upscaling of the developed innovative solutions throughout the country. Another interviewee also emphasizes the highly political nature of the sector, seeing it as time-consuming:

> When the municipality of Copenhagen is going to do something, they also have to ask the Department of Economy and a lot of others. And further, they have to make sure that the politicians agree to do this or that. So that's a very long preparation period before we actually start a project. (ARC, 2021, p. 27 of Appendix B)

Interviewees point out differences between Danish municipalities concerning waste management. Whereas smaller municipalities only have limited power and resources to develop innovative solutions, Copenhagen municipality is perceived to be strong and innovative with a clear vision and sufficient resources: "The municipality of Copenhagen, they have so many resources, not only money, but also manpower. So they are able to initiate a lot of very [...] beyond edge [...] projects. They really push the agenda for circular economy" (ARC, 2021, p. 27 of Appendix B).

The private sector sees it as imperative that the public sector provides the right frame allowing for innovative solutions:

> If you take a high level, the Environmental Protection Agency, of course, they are the ones setting the frames, what are you allowed to do or not. So they play a very important role in giving the private sector a playfield, because what we're doing here is super explorative. (Novo Nordisk, 2021, p. 225 of Appendix B)

Furthermore, the public sector can provide the private partners with special permissions and regulatory exemptions, for instance allowing the private sector to implement a take-back system like in the case of the Returpen partnership. That represents an example of extended producer responsibility (EPR)[2], which is a topic highly discussed by the partners: "So there's no doubt that the demands from society and from the European Commission towards companies like Novo Nordisk or everyone taking responsibility for the waste would only increase. The extended producer responsibility is just starting now" (Novo Nordisk, 2021, p. 226 of Appendix B). Several partners believe that especially

[2] Extended producer responsibility (EPR) can be defined "as an environmental policy approach in which a producer's responsibility for a product is extended to the post-consumer stage of a product's life cycle" (OECD, 2016, p. 21).

upscaling the projects is dependent on new waste reforms and changes in regulations regarding EPR.

PPI Agreements. The contractual agreements between the partners are perceived as very complex, especially from the perspective of the municipality. Intellectual property rights (IPR) need to be determined with regard to the publication of new knowledge and the use of the developed solutions. Furthermore, agreements on financial contribution and specification of the desired outcome are necessary. The collaboration agreements vary between different partnerships as there is no one-size-fits-all type of agreement. The establishment of PPI agreements is further complicated by procurement regulations regarding subsequent tendering procedures and by the risk of illegal state funding on the public sector's side. The complexity of PPI agreements is expressed by the public sector representative:

> I think in general the whole […] legislative part of it […] is quite complicated actually. Very complicated. And especially maybe for smaller municipalities where you don't really have the same level of resources for legal counseling and setting up different types of tendering procedures. For instance, a public-private innovation agreement is not something that you just do if you're not really used to it. It's quite complicated. And you have to look at state funding and who will own the property rights afterwards and all this. (CC, 2021a, p. 47 of Appendix B)

The European Union. The European Union is recognized as another aspect of the legal and regulatory context and plays a significant role in the FORCE project since it is an EU-funded initiative. As previously mentioned, obtaining funds for innovative solutions from the EU is regarded as a motivator and incentive to join a partnership. However, EU-funded innovation projects also comprise the obligation for thorough documentation and knowledge sharing, which requires additional time as well as willingness for transparency among the private actors:

> I think in general that the EU-funded projects are quite [...] bureaucratic to work with. It's a long process and [...] it takes a lot of time to develop all the material that shows that you have complied with your initial project description. Right, so you spend a lot of energy on that instead of doing the actual innovation. (CC, 2021d, p. 105 of Appendix B)

The resulting additional workload combined with the perception of a bureaucratic, administrative and hierarchical nature of the EU in general are regarded as negative aspects of participating in EU-funded initiatives. Furthermore, one of the FORCE partners perceives the partnership as being dominated by the public sector since they hold the contact with the EU representatives.

Conclusion. Since waste management falls under the authority of individual municipalities, partnerships depend on the regulatory frame imposed by the public sector, as well as on special permissions provided by the local governments. Furthermore, the sector is rather fragmented as there are differences between waste management systems between the municipalities. PPI agreements are necessary but complex due to the strict procurement rules and issues regarding IPR. EU projects provide a favorable funding opportunity but make the regulatory framework for PPIs more complex.

Summary of the Thematic Networks

The partner interviews reveal the importance of a focus on citizens in PPIs, either through direct involvement, through an effort to understand their wants and needs, or at least through unilateral external communication towards the public. The interviewees also emphasize the role of the public sector in educating citizens about waste management and they see societal trends as shaping the orientations of PPIs. Our findings assert the interdependence of the public and private sectors and the need for involving various stakeholders in the innovation process. Nonetheless, the interviewees point out that the two sectors' characteristics can both complement each other but also create tensions. Furthermore, the interviews underline the central role of knowledge sharing and experimentation in PPIs, highlighting the iterative nature of innovation development. The partners also put a great emphasis on applying their learnings in the future and upscaling the developed solutions.

Alignment on the vision, values and objectives of the PPIs together with mutual understanding and trust building among the partners are seen as essential aspects of the projects. Moreover, the interviewees stress the need for anchoring the partnerships and their goals within the individual organizations. Practical aspects of organizing and communication are deemed necessary by the partners, facilitated by a manager who, according to our findings, should be open, neutral and willing to take risks, and who should understand the various partners as well as the technical side of waste management. The interviews further reveal the resource-intensive nature of PPIs and highlight the importance of co-financing of the joint innovation development in the projects. The partners provide different opinions on EU projects and third-party funding. The waste management sector is described as highly regulated, influenced by politics, and fragmented across local governments. The partners stress the role of the public sector in providing a favorable environment for the establishment of PPIs.

The findings are clustered in the seven described thematic networks centered around their global themes – human-centeredness, multidisciplinarity, learning, alignment, interaction, resources, and legal and regulatory context – which are further used to navigate the data from the expert interviews and the studied literature.

Main Differences within the Case Study

Despite finding common themes in our data from the partner interviews, resulting in the construction of the seven thematic networks, we also identify several differences between the three partnerships and hypothesize about what had caused them. In analyzing the interviews, we find three main characteristics to be a source of differences among the PPIs: the focus of the project, the origin of the facilitator, and the presence of competitors in the project. In identifying the differences, we build the second layer of our analysis.

Focus of the Project

Our findings from the interviews show that the focus of a project can influence various aspects of its process. Both the FORCE project and the Partnership for circular food trays are technology-driven projects, focusing on new solutions in recycling plastic waste. The Returpen partnership, on the other hand, is to a large extent dependent on the users and the logistics within the value chain as it aims to develop a novel take-back scheme. Arguably, this has an impact on the level of user involvement and experimentation in the partnerships. Moreover, the focus alters the requirements on the facilitator – in the technology-driven projects, the interviewees emphasize the importance of the facilitator having technical skills and knowledge, which is not mentioned by the Returpen partners.

The role of the users/citizens and the degree of co-creation vary across the projects. In the Returpen partnership, the project's success is dependent on the users' willingness to return their used insulin pens to the pharmacies. Therefore, the partners emphasize the necessity of obtaining user feedback through co-creation workshops and interviews to understand their needs and to create a solution that is convenient for them. Moreover, Diabetesforeningen, an association representing insulin users, was identified as a key stakeholder by the project initiator and invited to the table as a partner from the very beginning.

In the two technology-driven projects, the citizens were not included in the project through co-creation and their role was relevant only in terms of external communication. For instance, the partners emphasize the need for the public sector to educate the citizens about sorting and recycling waste. And for the retailers, the importance of implementing a favorable branding strategy based on customer feedback is highlighted. In contrast with the Returpen partnership, the partners consisted only of public and private actors and did not include any organizations representing users. We thus assume that PPIs with a focus on technology in the waste management sector would typically include citizens to a lesser extent.

Similarly, even though interviewees from all partnerships perceive the steps of their collaborative processes to be iterative, we notice a higher degree of iteration and experimentation in the food trays and FORCE partnerships. The need for continuous tests and improvements of the technological processes is a shared theme. “Typically I start with setting up some initial experiments just to see what happens. And then you learn from that how to do it better and then you iterate towards a solution,” (DTI, 2021, p. 156 of Appendix B) describes one of the interviewees. Furthermore, the partners report that most of the challenges they had faced were various technical issues which often forced them to take a step back and try out another solution. Although the Returpen partnership is also described as rather iterative, with the partners having to “correct and adapt according to [their] learnings along the road” (Novo Nordisk, 2021, p. 235 of Appendix B), in contrast with the other two projects, the interviewees did not experience any major setbacks concerning the testing of the solution.

Facilitator

In the Returpen partnership, the initiator as well as facilitator of most of the collaborative process was a private company, Novo Nordisk. In the FORCE and food trays partnerships, it was the municipality initiating and coordinating the collaboration. We find that whether the facilitator originates from the public or the private sector has several implications for the process. Firstly, while Novo Nordisk identified the key stakeholders and invited them to partner up in a first *kick-off* meeting, the municipality usually initiates their partnerships with an *open call for partners* with predefined selection criteria (however, the municipality would also reach out directly to companies they consider as suitable partners). In the FORCE project, which operated under an EU initiative, the initiation of the partnership was even more lengthy with a complicated joint application process, perceived as bureaucratic. Similarly, the regulatory framework surrounding procurement procedures complicates not only the match-making phase of a project facilitated by the public sector but also its outcome, with the municipality having to provide equal access for every bidder to potential subsequent tenders for the solution.

The idea generation within the three partnerships was dominated by the initiators. However, there are differences in the degree to which the interviewees feel they have been involved in the idea generation as well as the goals and agenda setting. The Returpen partners perceive themselves to have been included in shaping the idea, goals and agendas to a very large extent:

> I think that was a strength that we kind of formulated this why, the big why, why are we making this project, we did that together. So everyone is very committed, I think, because we did this in collaboration with each other. It wasn't a defined agenda from Novo Nordisk that we do

> this this way and you do this and you do that. We did it together. (Danmarks Apotekerforeningen, 2021, p. 136 of Appendix B)

On the contrary, the partners of the FORCE and food trays partnerships describe the goals as being set by the public sector and agreed upon by the individual participants:

> Regarding what was on the table, I think the goals were the same and they were very clearly defined by the municipality of Copenhagen. And that's I mean, that's the idea of someone taking the lead. They sort of defined the project and made the partners accept it. (ARC, 2021, p. 31 of Appendix B)

This leads us to an assumption that the politically founded public sector goals are more rigid and less open to discussion.

Another difference in the partnerships is that in the Returpen project, Novo Nordisk hired an external facilitator to manage the start of the collaboration, including the alignment of vision and goals, and the co-creation workshops. The interviewee from the public sector, on the other hand, sees not only the benefits of having an external facilitator but also the downsides in the form of missing knowledge and lack of understanding of the partners in the value chain. Even though he highlights the role of an external facilitator in solving heated discussions, he believes that “it's a good idea to have a vested interest because it makes it more powerful, the partnership, as long as you can convince the other partners that you're not doing it because of only because of your own interests” (CC, 2021d, p. 108 of Appendix B). Moreover, one of the interviewees from the food trays partnership perceives the municipality to be the perfect facilitator because of their neutrality – they do not have any other (commercial) interest than making the project succeed. In that sense, including an external facilitator at least in the alignment phase, just like Novo Nordisk, might be a good choice in partnerships led by the private sector.

Competitors

As previously described, our analysis shows that including competitors in a partnership is generally perceived as challenging and might bring various issues. However, even though all three partnerships include competitors, they all have different experiences. In the food trays partnerships, complications arose between the two retailers, Coop and Rema1000, when it came to external communication and competition for media attention. The challenge was solved with further alignment and a legal document about the project’s external communication. Furthermore, the interviewee from Coop notes that they constantly needed to be aware of the competitor’s presence in order not to share any

competition-sensitive information. The barrier to knowledge sharing among competitors is highlighted by several interviewees and it was bypassed in the FORCE project by including indirect competitors. Even though there were two plastic manufacturing companies in the project, both in charge of developing the innovative products that the partnership aimed for, they shared information about the process freely, because they use very distinct technologies. One of the FORCE partners notes:

> Normally when you make such a project, you should try to avoid competitors. And that's why we chose to include companies with different processing technology, because then you can speak completely freely and we did that on all meetings because they were not competing in processes. (DTI, 2021, p. 162 of Appendix B)

In the Returpen partnership, two pharmaceutical distributors are involved. However, the partners do not report any tensions between them as they divided their responsibilities in supplying the different pharmacies according to their pre-established business relationships. Furthermore, the interviewees do not describe reluctance for knowledge sharing among the competitors either. Similarly, external communication in the project is regulated by a contract from the beginning of the project and carefully coordinated throughout the process. The facilitator emphasizes communicating as a unit, without any hierarchy among the partners which is perceived very well by the partners, who do not report any difficulties in connection to external communication. Nevertheless, the Returpen partnership also faces its challenges in connection to competition in the form of insulin pens from different pharmaceutical companies. In the ongoing pilot project, it is only Novo Nordisk's insulin pens that are collected to be recycled. The implications of that are twofold. Firstly, the collaborators had to ensure that the participating pharmacists are not going to be overwhelmed by the additional workload resulting from the need to sort out the various insulin pens. Secondly, for the project to scale up in the future, including other insulin pens and therefore other partners-competitors is necessary.

The interviewees' experiences implicate that the partnership setup should carefully consider the involvement of direct competitors and clearly divide responsibilities among them, paying attention especially to external communication which might require separate legal agreements. Alignment on those practicalities from the very beginning of the project reduces the risk of conflicts later in the process.

Summary of the Differences

The three studied partnerships differ in the extent to which they focus on co-creation with societal stakeholders and in the degree of iteration and experimentation. We attribute those differences to the different orientations they have, assuming that technology-driven PPIs in the waste management sector are likely to include less co-creation but more experimentation. The partnerships also vary in

connection to the facilitator of the process. Firstly, the objectives of the partnerships facilitated by the public sector are perceived as more or less imposed on the partners, while goals of the Returpen project are seen as a mutually developed shared agenda. The rigidity of political goals might explain that perception of the partners from the FORCE and food trays partnerships. Secondly, the initial alignment process in the Returpen partnership was facilitated by an external consultant, while the public sector representative provides arguments against involving external facilitators in the other two projects. Nevertheless, both the external and public sector facilitators are perceived as neutral, making the alignment between partners easier. Furthermore, the PPIs differ in their experiences with competitors' presence in the projects. Based on our findings, we argue that the involvement of direct competitors in PPIs requires extensive alignment and clear division of responsibilities between the partners from the beginning of the project.

The found differences underline the complexity of PPIs. Furthermore, the findings indicate that in some aspects, designing PPIs cannot follow universally applicable rules, but there needs to be enough flexibility to accommodate the variations. The differences are further taken into account in the following layers of the analysis.

Expert Input

The following section describes our findings from the expert interviews and explores them in relation to the seven thematic networks identified in the partner interviews – human-centeredness, multidisciplinarity, learning, alignment, interaction, resources, and legal and regulatory context. The third layer of the analysis builds on the expert input.

Human-Centeredness

Human-centeredness is also highly thematized in the expert interviews. Especially for circular economy, one of the experts notes that citizen involvement should be the starting point:

> Adopting circular solution, top-down doesn't really work because citizens...you can ask citizens to differentiate and to choose the right bin to throw their trash, but if they are not really engaged, this is not what they're going to do. (REFLOW EU Horizon 2020 project [REFLOW], 2021, p. 306 of Appendix B)

However, similarly to the partners' experiences, the experts argue that citizen engagement requires additional workload and a structured approach, and is currently challenged by the Covid-19 pandemic. Furthermore, the citizens' local context needs to be considered to understand their claims and to be able to interpret them in the right way. In many PPI projects, another expert articulates,

citizens are often overlooked which results in inconvenient solutions. He further suggests that citizens should therefore be involved “from the beginning, throughout the whole process” (EIT Climate-KIC Nordic [EIT], 2021, p. 272 of Appendix B). Similarly, the partners argue for involving users to create convenient and meaningful solutions. However, another expert interviewee emphasizes that it depends on the type of PPI whether it would make sense to include the users or not, which is also visible in the three innovation partnerships.

The experts confirm the partners’ notion that societal trends have a huge impact on the focus as well as the timing of PPI projects. As an example, one interviewee articulates the matter of the Covid-19 pandemic: “Pushing really hard on reusables right now is difficult because there are so many people just freaking out about possibilities of getting infected” (C40 Cities [C40], 2021, p. 252 of Appendix B). Furthermore, the expert notes that raising public awareness of the issues connected with solid waste management can be an enabler for establishing more PPIs in that sector. Currently, the public debate about climate change is dominated by topics such as energy, building, and transport, but neglects the impact of waste management.

Multidisciplinarity

In accordance with our findings from the partnerships, the experts affirm that complex challenges such as sustainability or circularity require collaborative innovation leading to systems changes. They emphasize the need to work across the public and private sectors and value chains as well as the need for international partnerships. Moreover, the positive correlation between diversity and innovation is asserted by the experts: “We want to create something new, something novel that could be evolved. And that's why we want this diversity of researchers, private companies, startups, SMEs, hospitals, utility services and so on” (EIT, 2021, p. 263 of Appendix B). Some of the interviewees specifically highlight the role of SMEs and universities in PPIs – those are types of actors that are not represented in the studied partnerships. In relation to understanding the citizens, involving anthropologists is considered to bring a beneficial perspective.

However, the experts also point out the difficulties connected to multidisciplinary collaboration. “It's often time consuming to do these things where there is big diversity in a group” (EIT, 2021, p. 271 of Appendix B) explains one of the experts. The time demands would be even higher in the case of third-party funding since it would require alignment between not only the private and public actors but also the funder. Similarly to the partners, the experts stress the tensions between the inherent differences of the public and private sectors – especially in terms of agility and speed in connection to high bureaucracy and dependency on politics in the public sector. However, the experts also agree that the two sectors need to combine their skills to implement systemic innovation and circularity:

> I think it's definitely necessary for both of them to have a role, and a different role because they have a set of different advantages and disadvantages. And partnerships, in some sense, are probably helpful in terms of helping them to understand the whole spectrum and what role actually each one can and should take. (C40, 2021, p. 254 of Appendix B)

In terms of the interdependence of the sectors, the private sector is associated with the needed innovation power and financial resources, while the public sector provides an opportunity to "actually co-develop a solution together with a critical market stakeholder" (Leaderlab, 2021, p. 284 of Appendix B).

Learning

The expert interviews assert the importance of iteration in PPIs. "It has to have room to maneuver and you have to have the ability to learn and change and iterate on your solutions," (Leaderlab, 2021, p. 282 of Appendix B) explains one of the experts. Iteration is also essential in finding a *win-win* situation for all partners. Furthermore, the experts link iteration to design thinking, which is seen as a critical part of PPIs. Besides the iterative nature of the process, the ability to ask the right questions towards oneself as well as the other partners is highlighted as an important aspect of design thinking:

> I think any good partnership is built on, you know, an ability to ask the right questions of each other. So as a public organization, what is actually the thing you are looking for a solution on? And often we actually spend a lot of time with the organizations developing those core design questions. What is it, actually? Are you certain that you know what it is you're actually looking for? (Leaderlab, 2021, p. 293 of Appendix B)

One of the experts sees design thinking as a useful guiding tool for municipalities in innovation projects. "The way they work is inherently linked to this methodology because they really feel it reflects their needs in some way," (REFLOW, 2021, p. 305 of Appendix B) the interviewee explains. The need for experimentation is highlighted also in relation to building incremental innovation and continuously sharing the smaller achievements as a part of both external branding strategy as well as internal communication, ensuring interest in the project.

The expert interviews also support our previously described findings in terms of reluctance of the private actors to share their knowledge with one another. One expert argues that including SMEs in PPIs can be beneficial in terms of knowledge sharing as they are eager to get exposure as well as to learn from others, and they might provide unconventional insights. Furthermore, the interviewees agree on the need to apply learnings from PPIs in the future. For municipalities, they emphasize the importance of sharing successful solutions so that other cities can replicate some of its features

based on their possibilities. In one of the expert's point of view, the learnings from PPIs are more important than the actual implementation of the developed solution in the market. "For me, success lies in the strategic capacity of these organizations to scale their efforts within their domain more than on the very specific solution," (Leaderlab, 2021, p. 285 of Appendix B) explains the interviewee, pointing out the importance of the public and private actors learning to work together and learning from one another. For the municipality, the expert highlights the benefit of being able to implement similar innovative solutions in another context. For the private sector, it is the ability to bring the solutions to other markets or to scale up.

Alignment

Corresponding to the partners' point of view, the experts emphasize the importance of dedicating a decent amount of time in the very beginning of a project to build mutual understanding and common ground between the partners. Especially in PPIs, where the differences between the public and private sectors can create tensions, this early alignment is crucial to *kickstart* a project, as noted by one of the experts:

> You create the spaces for trust and relationship building, so you get these projects moving. And that's why I always spent a lot of time in the beginning of projects, to get things on the move and let people talk so we can get to know each other. (EIT, 2021, p. 264 of Appendix B)

One expert draws from her experience, saying that the predefined project settings of EU-funded initiatives can help to align the partners' goals. She has experienced that participating actors in EU-funded projects show their commitment and interest by going beyond the predefined goals. However, another expert points out that "if it's a public-private innovation project that is driven by a funding opportunity rather than a real need" (Leaderlab, 2021, p. 286 of Appendix B), the project can lack the needed common ground and become a *resource swap* without a clear direction. Similarly, the issue of lower commitment in third-party funded initiatives is also raised by the representative of the municipality.

Regarding the actual alignment, one expert notes that innovation projects need *room to maneuver* that gives the partners the ability to learn, change and iterate on their solution. This includes building common ground and shared values, a clear mission and vision, and aligning resources. Unlike the partners, who do not perceive any impact of the resource allocation on the power distribution, one of the experts asserts the importance of aligning power distribution in a project based on resources. Furthermore, understanding who brings in what kind of resources from the very beginning helps to build room for innovation and creates clarity of what can be done and when. Another expert proposes

to use challenges as a starting point for defining a common vision and future scenarios. Furthermore, the experts mention the importance of aligning the timeframe and understanding each other's risks and KPIs to create a win-win situation. This is brought to the point by the following quote:

> But in the end, the core of it is about expectation. Expectation management is continually around in the communication and trying to ask people, no matter where you are in the process, do you know what we're doing now, is this meeting your needs and do you know where we're heading. Like continually questioning your own process, continually questioning your own set up and continually trying to ensure that the people actually understand where we are. (Leaderlab, 2021, p. 294 of Appendix B)

Regarding the partnership's targets, one expert claims that the partners should be transparent about their underlying goals. Another aspect pointed out by one of the experts is that creating a mutual understanding of waste management within a global context is rather challenging due to cultural differences. This correlates with the partners' notion that the differences in waste management regulations not only on an international, but also on a national and regional level, present a challenge for PPIs in the sector.

According to the experts, PPIs also require alignment within the partners' organizations and constant internal communication about the project. This corresponds to what the partners claim about internal alignment. One expert highlights that without this kind of alignment in the public sector, the project runs the danger of disconnecting from the original need. Especially in the waste management sector, the individual partners also need to understand what circular economy means for their organization to create a shared vision and concrete targets within the partnership. In terms of internal alignment, the level of project ownership within an organization is also addressed: "The higher the ownership is in an organization, I think the better results, the more resources" (EIT, 2021, p. 273 of Appendix B).

Interaction

Corresponding with the partners' beliefs regarding the project facilitator's skills, the experts assert the importance of open-mindedness and listening skills. Furthermore, they also agree that a holistic overview of the project and skills in communication, stakeholder management or project delivery are essential. They further emphasize that the facilitator needs to have a high degree of interpersonal skills and to understand the various partners. However, in contrast with the partner interviews, the experts also highlight the need for innovation thinking or design thinking skills: "That ability to continually drive the innovation process forward through the design questions and through an intuitive thinking or the solution bringing forward, I would say, is also a really important competence for a partnership facilitator" (Leaderlab, 2021, p. 296 of Appendix B).

Benefits of including an external consultant in the process dominate the expert views on partnership facilitation. Firstly, having a neutral facilitator is essential for facilitating a dialogue between the private and public sectors and for bridging between their interests. However, one of the experts argues that it should be possible for the public sector to assume such a neutral role: “But you can definitely have the competence internally and should have the competence internally in a public organization if you're looking to do PPIs” (Leaderlab, 2021 p. 290 of Appendix B). Secondly, the experts highlight the innovation skills brought in by external facilitators:

> You need someone with experience with facilitating innovation processes to get things going. Otherwise, you might be just bringing business as usual to the table and then you get something new out of it, but not quite as important or radical as you maybe have wanted in the beginning. (EIT, 2021, p. 264 of Appendix B)

Thirdly, as cities can become overwhelmed with bureaucracy, one of the experts argues that external facilitators are better suited for managing the project because of their agility, proactive approach and responsiveness to the ever-changing needs of the project.

In terms of organizing, two main aspects are discussed by the experts. Firstly, splitting up the partners into smaller working groups is seen as beneficial. However, one of the experts argues that such decision depends on the size of the project and organizations. Secondly, having a limited timeframe for PPIs is described as necessary, because if they run for too long, the innovation aspect disappears, and they start resembling regular partnerships.

Resources

In terms of financing, one of the experts points out that private actors often come into projects with a mindset that is not suitable for PPIs:

> If they go in and say, this is just for us about selling a solution, but they don't have the ability to listen to the customer needs and co-develop and are ready to actually tailor their solution, it will fail. (Leaderlab, 2021, p. 288 of Appendix B)

As also confirmed by the municipal representative, finding the right private partners who are willing to co-finance and co-develop the solution together with the public sector is, thus, essential.

The experts agree that a greater extent of public sector investment and risk-taking can be an enabler for PPIs. “Perhaps the expectation that private sector brings in the funding is not always that realistic, specifically for areas where there's a lot of innovation needed,” (C40, 2021, p. 252 of Appendix B)

explains one of the interviewees. This is especially true for SMEs which operate with limited resources and choosing a project that fails can be fatal for them. However, the experts emphasize the importance of including SMEs in PPIs:

> It's very much around developing rather […] [than] developing a piece of infrastructure or developing a new very specific solution, it is about also nurturing an ecosystem, innovation ecosystem. And in that context, you need to have the SMEs involved and you need to also do it on the terms of the SMEs. (Leaderlab, 2021, p. 292 of Appendix B)

The involvement of SMEs can be enabled by third-party funding which is also seen to have a positive effect on (inter)national branding of a partnership. While third-party funding decreases the financial risks of individual partners, the experts also emphasize its potential drawbacks. As previously described, third-party funding might decrease the commitment to the project. Furthermore, the experts point out that having to take into account the objectives of the funder can slow down the process and disable a bottom-up approach.

Legal and Regulatory Context

The experts believe that legislation and regulations could be barriers to innovation in PPIs. General data protection regulations are mentioned as one example: “GDPR actually is a barrier for innovation in public private partnerships because you're not allowed to reach out so much anymore” (EIT, 2021, p. 258 of Appendix B). Furthermore, another limitation to PPI initiatives are regulations that constrain the extended producer responsibility (EPR) in waste management.

As also mentioned by the partners, the experts note that one argument for collaborating with the public sector is their provision of a frame or *playfield* in which private organizations can operate and innovate. The public sector has “the ability to legislate and create an environment that can allow for specific things to unfold and develop” (C40, 2021, p. 250 of Appendix B). However, in setting the right frame, municipalities also depend on the changing priorities in politics. Therefore, it is challenging for municipalities to follow long-term strategies and it is imperative to choose the right timing for collaborative innovation projects. In this regard, another expert explains that public organizations need to create an innovation ecosystem that can keep delivering solutions to them:

> I think in the political landscape of a public organization, you will often need more certainty that there is a given chance that you can reach the political target you set. But having said that, they still depend on a thriving innovation ecosystem and they understand that they are part of actually building up that innovation ecosystem (Leaderlab, 2021, p. 284 of Appendix B).

From the experts' point of view, partnerships can be implemented more easily when the respective sector is already well established. Nevertheless, this might be challenging for the waste management sector since, according to the experts' experiences, there are differences on national and subnational levels of the legislation and regulations.

The experts' notions correspond with the partners' experiences that third-party funding, such as from the EU, is bound by additional obligations and increases the complexity. With regard to EU projects, one expert explains that "some of the bureaucracy actually is a barrier for collaboration and innovation" (EIT, 2021 p. 259 of Appendix B).

In terms of PPI agreements, one of the experts stresses the importance of distinguishing the contract, which includes agreements about resource contribution and IPR, from a *charter* which defines and aligns values and outlines how the partners intend to collaborate: "I think that scenario, charter/contract kind of split has often worked for us and as you say, trying to keep not putting the scenario and a value part into a contract because that's not where it belongs" (Leaderlab, 2021, p. 283 of Appendix B). This opinion is shared by several partners from different partnerships, who see non-binding agreements as a fundament for goal alignment and trust building. It is further noted by the experts that the public sector needs to have legal counselling to ensure that the private sector does not only try to *sell* a solution, but rather collaborates to *jointly develop* a solution.

Summary of the Expert Input

The experts emphasize the need for citizen involvement while pointing out the inherent complexity as well as its relevance for only some types of PPIs, which corresponds to our findings from the partners. Furthermore, the experts confirm the central role of both societal trends and the interdependence of the public and private sectors in PPI establishment. The interviews reveal the positive impact of diversity on innovative outcomes but, in accordance with the partner interviews, highlight the potential tensions and complexity stemming from a multidisciplinary approach. On top of iteration, already identified as essential for PPIs by the partners, the experts also assert the importance of design thinking skills among the participants and especially in the role of the facilitator. Furthermore, they provide arguments for the involvement of external facilitators in PPIs. Corresponding to our previous findings, the expert interviews address upscaling or replicating of the developed solutions while emphasizing the role of the individual partners' innovation capacity gained throughout the process.

The importance of early alignment and of building a common ground between the partners as well as within the individual organizations is also highlighted. In contrast with the partners, the experts point out the relation between resource contribution and power distribution in a partnership. The

experts discuss the need for involving SMEs and startups in PPIs, which can be enabled by third-party funding – however, they also highlight the drawbacks of third-party funding. According to the experts, regulations are often a barrier to innovative outcomes in PPIs. Therefore, they stress the public sector's role in creating a favorable environment for PPIs, in accordance with the partners' opinions. Furthermore, our findings from both the partner and expert interviews show the benefits of establishing a non-binding agreement outlining the vision of the partnership next to the legal agreement specifying, for instance, resource contribution and desired outcomes.

The expert input provides our analysis with findings outside of the studied PPIs, enabling us to draw more generalizable conclusions. This tendency is consolidated in the following layer of the analysis.

Data Interpretation

In the last layer of our analysis, we compare the findings within the identified thematic networks to the reviewed literature from the fields of PPPs, PPIs, innovation, design thinking, and collaborative governance to interpret the themes and concepts identified in both the partner and the expert interviews.

Human-Centeredness

The topic of citizen involvement is underrepresented in PPP literature (Nederhand & Klijn; 2017) and according to several authors (e.g., Ahmed & Ali, 2006; Hodge & Greve, 2007), citizens are typically neglected in PPPs. Similarly, lack of citizen involvement is also recognized in two out of the three studied partnerships as well as articulated by the experts. Only a few studies, anchored in the context of waste management in developing countries, emphasize the importance of citizen engagement (e.g., Ahmed & Ali, 2006; Forsyth, 2005; Kruljac, 2012). However, Nederhand and Klijn (2017) suggest that citizen involvement is typically lower in technology-driven PPPs, compared to projects from other fields. That corresponds with our findings about the differences between partnerships and with one of the expert's view that it is not always suitable to engage citizens.

On the other hand, New Public Governance, which provides an argument for the establishment of PPPs (Klijn, 2010), favors collaboration with citizens (Torfing & Triantafillou, 2016). Furthermore, according to the reviewed literature, citizen involvement can enhance transparency (Ahmed & Ali, 2006) and legitimacy (Hodge & Greve, 2007), reduce costs (Forsyth, 2005), and drive innovation in the public sector (Bason, 2018; Eggers & Singh, 2009) as well as in PPIs (Brogaard, 2021; Nederhand & Klijn, 2017). Those arguments support the Returpen partnership interviewees' perception of the central role of users and the experts' opinion that citizens should be involved in the process from

the very start. Furthermore, a human-centered approach and co-creation represent the building blocks of design thinking (Brown, 2007; Liedtka & Ogilvie, 2011; Nakata & Hawang, 2020) and the Double Diamond framework for innovation processes (Design Council, 2015). This suggests that the adoption of a design thinking mindset and involving the citizens in PPPs/PPIs might positively impact their innovative outcomes.

While external communication is a highly discussed topic among the partners, the reviewed literature disregards this aspect of PPPs, with only Yescombe and Farquharson (2018) asserting the importance of reciprocal communication with stakeholders. Similarly, the partners and experts identify societal trends as a driver for PPI establishment, whereas the literature overlooks such trends, except for the system context in the collaborative governance framework by Emerson et al. (2012).

Multidisciplinarity

Similarly to the partner and expert interviews, the studied PPP literature highlights the tensions stemming from the differences between the public and private sectors, such as different goals, values, financial systems and timeframes (e.g., Klijn & Teisman,2003; Van Ham & Koppenjan, 2001; Warsen et al., 2020). Moreover, several authors (e.g., Klijn & Teisman, 2003; Van Ham & Koppenjan, 2001) argue that those differences are often the source of risks perceived by the different partners. Some of the public sector characteristics, like bureaucracy and lack of agility or risk-willingness, are generally perceived as barriers to public sector innovation (Bason, 2018; Eggers & Singh, 2009).

In further accordance with the partner interviews, the literature also asserts the interdependence of the public and private sectors, especially in terms of resources (e.g., Hodge & Greve, 2013; Li & Akintoye, 2003; Scott & Thomas, 2007; Van Ham & Koppenjan, 2001). Different authors also highlight the need for collaboration to address complex societal and environmental challenges (Bossink, 2013; Emerson et al., 2012; Huxhham & Vangen, 2000), which is a belief shared among the partners and experts as well. However, several authors (e.g., Dittmer et al., 2009; Hodge & Greve, 2007) argue that private actors are attracted to PPPs because of the promise of new business opportunities. This is in contrast with the partner interviews, in which the private partners name different reasons to collaborate, such as implementing their CSR agendas, promoting sustainability, gaining new knowledge or helping a business partner. In some cases, the partners joined the projects despite their costs and without a vision of a positive business case.

Matching the distinct strengths and weaknesses of the two sectors through PPPs is believed to lead to innovative outcomes that none of the partners could achieve alone (Brogaard, 2021; Carbonara & Pellegrino, 2020; Hodge & Greve, 2013; Jeffares et al., 2013; Klijn, 2010). Even outside of the PPP context, multidisciplinary collaboration involving various stakeholders is seen as an essential

part of innovation processes as well as a principle of design thinking (Brown, 2008; Eggers & Singh, 2009; Liedtka, 2015; von Thienen et al., 2014).

Learning

Iterative processes are rarely addressed in PPP literature as opposed to other fields of research, such as collaborative governance, innovation and design thinking. The iterative nature of collaborative processes is indicated by Emerson et al. (2012) in their collaborative governance framework. Also, the innovation and design thinking literature describes innovation processes as cyclical and iterative (Eggers & Singh, 2009; Van de Ven et al., 2007), characterized by an alternation between divergent and convergent thinking (Brown & Katz, 2009; Design Council, 2015). Particularly the development/implementation phase of innovative processes often includes experimenting and testing of possible solutions (Amabile, 1988; Eggers & Singh, 2009). Despite the absence of the concept of iteration in PPP literature, our findings from the expert interviews identify iteration as a driving element for innovation in PPIs. By the same token, the partners describe the processes in the studied projects as iterative and driven by experimentation, especially in the technology-focused projects.

The reviewed literature suggests that *ideal* PPPs incorporate the principles of learning from each other and exchanging knowledge (Jeffares et al., 2013). However, especially private parties would often fear to lose their competitive advantage and be reluctant to share their knowledge (Dittmer et al. 2009). This coincides with the view of the partners and experts that knowledge sharing is essential for innovation partnerships. Both the partners and the experts put high emphasis on joint knowledge generation and sharing and associate a partnership's success with the resulting learnings.

The variety of possible forms of innovative outcomes that is described in the reviewed literature (e.g., Crossan & Apaydin, 2010) also becomes apparent in our findings from the partnership interviews. With regard to Wang and Ahmed (2004), the technological feasibility of the partnerships corresponds to *process innovation*, the new food trays made from recycled plastic relate to *product innovation*, and the take-back system in the Returpen partnership could be described as *service innovation*. Moreover, the partnerships as such might be referred to as *supply chain innovation* as described by Arlbjørn et al. (2011).

Evald et al. (2014) identify a lack of PPI studies specifically focusing on the implementation and commercialization of the developed solutions. On the other hand, scholars in the public sector innovation literature argue that the diffusion or dissemination of innovation would require the right capabilities, as well as stakeholder support and acceptance (Bason, 2018; Eggers & Singh, 2009). Similarly, the partners indicate that upscaling requires involvement of more stakeholders such as other municipalities and competitors in order to get their acceptance and support. Furthermore, capabilities

in the form of financial and infrastructural resources are needed to upscale the pilot projects, which is also mentioned by the experts as *strategic capacity for upscaling*. Innovation capacity building throughout the PPI process is seen as an essential benefit of the partnerships by both the partners and the experts, enabling further implementation of the developed solutions or establishment of other innovation projects. The building of innovation capacity in the public sector can be connected to the public sector innovation ecosystem described by Bason (2018). In the research of collaborative governance, Emerson et al. (2012) see the outcome of collaborative actions in their framework as *impacts*, which adjust the system context, and *adaptations*, that change the collaboration dynamics and the system context. By the same token, the research of Bossink (2013) addresses the potential of PPPs to impact future practices in their respective sectors. The partners are confident that PPIs have the potential to positively impact the waste management sector, spur further technological developments in the industry, and lead to future partnerships with some of the partners.

Alignment

Just like the partners and the experts, researchers emphasize the need for and importance of aligning expectations, risks and power relations and creating a mutual understanding and trust at the very beginning of PPP projects (Huxham & Vangen, 2000; Klijn, 2010; Osborne & Murray, 2000; Van Ham & Koppenjan, 2001; Warsen et al. 2018, 2020). These aspects are also integral parts of the framework for collaborative governance by Emerson et. al (2012) in building a shared motivation. The reviewed literature and the partners agree on the benefit of building on previous relationships (Osborne & Murray, 2000). Moreover, innovation process literature also considers initial alignment as an essential part of the idea generation phase (e.g., Amabile, 1988; Crossan & Apaydin, 2010; Eggers & Singh, 2009). Van Ham and Koppenjan (2001) argue for alignment in PPPs with all partners *together*, which is also thematized in collaborative governance research as *joint* decision making (Thomson & Perry, 2006) and reflected in the partner and expert interviews as inclusive approach.

To enhance innovative outcomes in PPPs, the studied literature reveals the need for trust building (Brogaard, 2017, 2021; Carbonara & Pellegrino, 2020; Eaton et al., 2006), a shared vision (Eaton et al., 2006) and shared goals (Brogaard, 2021). Findings from the partner interviews show that partners have shared higher-level goals and visions, but different underlying goals and values caused by the nature of their businesses. Both the partners and experts agree that sharing the same higher-level goals and visions contributes to a partnership's success. Nevertheless, the experts argue that the underlying goals need to be made transparent in order not to create a barrier to collaboration. By the same token, the reviewed literature emphasizes the need for understanding each partner's underlying values and viewpoints to align expectations (Warsen et al., 2020).

The studied literature further indicates that PPI projects require internal alignment and capacity building within the partners' respective organizations (Brogaard, 2017; Eggers and Singh, 2009). Corresponding to one of the expert's view, Bason (2018) argues that especially public organizations need to build the right innovation ecosystem to drive public sector innovation. Furthermore, Emerson et al. (2012) argue that creating internal legitimacy is imperative for desirable collaborative dynamics. The researchers' take on internal alignment connects to our findings from the partner interviews and is emphasized in more detail by the interviewed experts who, for instance, relate a project's success to the positioning of the project within the partners' companies.

Interaction

Van Ham and Koppenjan (2001) and Jeffares et al. (2013) highlight the importance of a clear division of roles in PPPs. Van Ham and Koppenjan (2001) associate the role allocation with certain risks, costs and benefits and assign the directing role mainly to the public sector whereas the private sector would usually take the management role. Nevertheless, this role assignment is different from the studied innovation partnerships since the Returpen partnership is directed by a private organization and the FORCE and food trays partnerships are managed by the public sector. However, the partner interviews correspond with the reviewed literature in the notion that the initiator's role is tied to greater risks and responsibilities.

Researchers stress the importance of organizing aspects like communication and open dialogues (Eaton et al., 2006; Van Ham & Koppenjan, 2001) for the PPP process. In terms of collaborative governance, building a capacity for joint action, according to Emerson et al. (2012), also requires determination of decision rules, operating protocols, and informal norms. However, in contrast to the partners and the experts, the studied literature does not go into practical details, as to, for instance, how project partners should be assigned to working groups.

Management of internal processes and external factors in general is seen as essential for PPP processes (Osborne & Murray, 2000; Warsen et al., 2018). Moreover, openness, communication (Eaton et al., 2006) as well as project management skills and innovation training (Brogaard, 2021; 2017) are regarded as to drive innovative outcomes in PPPs. Outside of the PPP context, other researchers recognize various personal skills that spur innovation, such as individual creativity (Amabile, 1988), courage to innovate, discovery and cognitive skills (Dyer et al., 2001), as well as cross-functional and design thinking abilities (Brown & Katz, 2019; Design Council, 2015; Kahn, 2018; Lewrick et al., 2020). The Design Council (2015) highlights that engagement of the partners and certain leadership skills like openness, experimentative attitude, and agility drive innovative outcomes. The skills, identified by the researchers, that make collaborative processes work and even lead to innovation, are

also addressed by the partners. However, the need for innovation skills as well as design thinking abilities is explicitly indicated only by the experts. The partners put more emphasis on practical skills of the project manager, such as coordination abilities, and technical and legal knowledge. While the role of an external facilitator is discussed in both the partner and (especially) expert interviews, the reviewed literature rarely examines the topic, except for Ahmed and Ali (2007) who assert the importance of facilitators in creating public-private-people partnerships in developing countries.

Resources

According to Van Ham and Koppenjan (2001), PPPs are, among other things, characterized by sharing costs and resources. Researchers argue that sufficient resources are required for an *ideal* PPP (Jeffares et al. 2013) as well as to drive collaborative governance (Emerson et al., 2012). The need for sharing costs and co-financing innovative solutions is also addressed by the partners. Similarly, the experts point out that the willingness of private partners to co-finance instead of just selling a solution is imperative for the establishment of PPIs.

Ysa et al. (2013) associate PPIs with greater financial risks for the involved partners because they are co-financing the development for an uncertain solution instead of acquiring or selling an already existing solution. Furthermore, Dittmer et al. (2009) argue that co-financing might be a barrier for SMEs to join PPIs since they lack financial resources. This correlates with the findings from the partner and expert interviews that it is more difficult for SMEs and startups to co-finance the innovation development.

Legal and Regulatory Context

The reviewed literature points out two opposing viewpoints on the impact of contracts in PPPs. On one hand, some researchers see the need for contracts to avoid uncertainties (Van Ham & Koppenjan, 2001) and argue that contracts could be designed in a way to enhance innovation (Rangel & Galende, 2010), for instance, through performance-based incentives (Carbonara & Pellegrino, 2020). The need for certain contractual agreements in general is also confirmed among the partner interviewees in terms of IPR, resources, financing, and subsequent tendering.

On the other hand, some researchers associate barriers with contractual agreements since they would not necessarily lead to success and innovation and might even have a negative impact on PPP performances (Klijn & Koppenjan, 2016). Indeed, some researchers argue that contracts could disable innovative outcomes (Klijn & Teisman, 2003) and creative ideas (Warsen et al. 2018). Furthermore, complex procurement regulation could be a barrier to joining PPPs (Van Ham & Koppenjan, 2001) and hinder innovative collaborations (Dittmer et al. 2009). This coincides with some of the

partners' perception regarding the high complexity of contractual and legal aspects of PPIs. In the same line of thought, Warsen et al. (2018) suggest that in order to make collaboration work, relational aspects like trust and management might be more important than contracts. Similarly, the partners and experts also associate the collaborative success and innovative outcomes with relational aspects rather than contractual agreements. In general, it is noted that the reviewed literature about PPPs and PPIs puts a lot of emphasis on the impact of contractual agreements on a collaboration's success and innovative outcome whereas the partners do not necessarily relate their contractual agreements to the partnerships' success and outcomes.

Researchers emphasize several impacts of the legal and regulatory context on PPPs. Considering the legal, political, and structural aspects of the system context is necessary for collaboration (Emerson et al. 2012), and for building the right capacity for public sector innovation (Bason, 2018). The emergence of the NPG paradigm (Osborne, 2006) would enable the establishment of PPPs (Klijn, 2010) and Bossink (2013) also argues that a *governmental push* through policy plans, regulations, and economic incentives represents an enabler for the establishment of eco-innovative public-private partnerships. This corresponds with the experts' and partners' claims about the public sector's role in providing the right regulatory frame that allows for collaborative innovation. However, Emerson et al. (2012) also point out that the system context might not only enable, but also constrain collaboration. This is also perceived by the partners and experts as, for instance, with the differences in waste management systems and the sector's dependency on politics.

The argumentation of Hodge and Greve (2007) and Van Ham and Koppenjan (2001) about private partners' intention of joining PPPs to increase their influence on policies could be related to the innovation partnerships and the partners desire to be more involved in shaping regulations regarding waste management, for instance the EPR.

Summary of the Data Interpretation

The following section provides a summary of the four layers of our analysis, describing our main findings within the constructed thematic networks.

Human-Centeredness. Our analysis leads to the following findings within the global theme of human-centeredness. Societal trends are drivers for establishing PPIs. They provide reasons for the partners to collaborate and implicate the necessity for involving stakeholders that represent the society. Furthermore, societal trends pave the way for a shared agenda among the partners and, therefore, ease their alignment. Projects driven by societal trends make their outcomes relevant, but not necessarily more innovative. User involvement through co-creation might be a challenge for collaborative processes due to the concomitant increase in complexity. Nonetheless, since innovation

can be seen as a novel solution with added value, co-creation has an impact on the innovative outcomes of PPIs because users provide insights into what adds value to the solution. Furthermore, since diversity is connected to innovation, it is crucial to include a diverse set of stakeholders, thus also the citizens. Nevertheless, the objectives and nature of the project determine the relevance and the degree to which citizens should be included in the process. External communication is an important aspect of any partnership, however, due to its unilateral nature it does not provide any input to the project that could enhance the innovative outcome. Nevertheless, public sector communication in the form of educating the citizens can create a basis for future innovative solutions. For instance, innovative recycling solutions would require citizens sorting their waste in the right way.

Multidisciplinarity. For the global theme multidisciplinarity, the four layers of our analysis reveal the following findings. Stakeholder diversity, especially the differences in the nature of the public and private sectors, increases the complexity of a collaboration and might cause tensions. However, combining the strengths of multiple stakeholders, particularly of the public and private sectors, is necessary because they are dependent on one another. Furthermore, diversity within partnerships allows to reach innovative outcomes that are relevant for the largest possible range of actors. Private actors that are driven by vision and not only by financial incentives are more likely to join PPIs and willing to co-develop and experiment to create innovative solutions. However, as private actors need to ensure the profitability of their businesses, PPIs should not be limited to the scope of pilot projects. From the beginning and throughout the process, the partnership should put emphasis on the ambition of reaching economic viability of the innovative solution and hold the aspiration for upscaling in the future.

Learning. Our analysis leads to the following findings regarding the global theme of learning. Experimentation, iteration and pilot projects, associated with design thinking, enable innovation but are, at the same time, resource-intensive. Knowledge sharing creates a better understanding of the challenge, the partners and the whole value chain and leads to innovative solutions that are suitable and relevant for many stakeholders. However, competing partners might be reluctant to share knowledge, which thus poses a barrier to the innovative solution. The increased workload for the project partners that stems from knowledge sharing, especially in EU projects, is not seen as a barrier to innovative outcomes in PPIs. To avoid falling back into business as usual after the development of an innovative solution, the PPIs must be upscaled and the innovative solutions need to be spread in the industry, other cities or regions. That requires further resources, inclusion of more stakeholders, and, specifically in the waste management sector, might depend on changes in legislation (e.g., EPR). Furthermore, the internal capacity built through a PPI can allow for upscaling and development of other innovative solutions in the future.

Alignment. Combining the four layers of the analysis leads to the following findings regarding the global theme of alignment. Early alignment of goals, visions and expectations, as well as trust building and mutual understanding are important for the success of any type of PPP. To reach innovative outcomes, it is therefore imperative that those aspects are present in PPIs as well, especially due to the high degree of uncertainty connected to innovation projects. However, as such they do not directly impact the innovativeness of the outcomes. Nevertheless, internal alignment is an essential driver for innovation in PPIs since partners might be more committed to the project and more eager to innovate if their corporate strategy focuses on innovation.

Interaction. For the global theme of interaction, our analysis results in the following findings. Organizing aspects like communication, division of roles and responsibilities, project management, etc., also represent underlying conditions for any type of PPP. Therefore, to reach innovative outcomes, it is imperative that those aspects are present in PPIs as well. However, they do not impact the innovativeness of the outcomes as such. Nevertheless, specifically in innovation partnerships, the partners need to accept the unpredictability of the time horizon in innovation processes to avoid possible conflicts and misleading expectations. Furthermore, general project management skills are imperative for every PPP. However, design thinking skills, risk-taking, passion, as well as knowledge concerning legal issues and IPR are especially important for innovation development. Moreover, the presence of an external consultant could be a driver for innovation for two main reasons. Firstly, they can contribute with design thinking and innovation skills which might be absent among the project partners. Secondly, they maintain the innovative outcome as the goal of the partnership without leaning towards individual underlying intentions such as profit maximization or political goals.

Resources. The results of our analysis incorporate the following findings for the global theme of resources. Innovation requires various resources such as financing, technology, knowledge, skills, facilities and manpower. Furthermore, for PPIs, the public and private sectors need to have the willingness to take risks, both in terms of co-financing and co-development of an innovative solution. Third-party funding, such as from the EU, could lower the risk for the partners and incentivize them to join the project, leading to more diversity, and thus innovation. Third-party funding might also enable startups and SMEs, which are typically unable to participate due to lack of resources, to join PPIs and contribute to the diversity with their perspective, which is characterized by agility and an innovative mindset. However, third-party financing can also pose a barrier to innovation as it increases the complexity of the partnership because third-party interests need to be taken into account as well. Furthermore, the funding opportunity might attract actors with lower commitment to the project, and thus to the innovation, because they are driven by a funding opportunity rather than a real need.

Legal and Regulatory Context. Our analysis results in the following findings about the global theme of legal and regulatory context. The development of innovative solutions requires a favorable regulatory, political and legal environment. Furthermore, specifically in the waste management sector, innovation might require new regulations in place (e.g., EPR), particularly for upscaling the innovative solution. Regulatory differences in waste management on an (inter)national level might be a barrier to upscaling of the innovation. Moreover, changes in political goals and priorities stemming from recurring governmental elections could be a barrier to establishing PPIs and implementing the outcomes of the partnerships. Contractual agreements in PPIs are obligatory but seem less important for the innovative outcome than relational factors between the partners. By the same token, non-binding agreements regarding the vision and goal alignment should be kept separate from the legal contract to create room for innovation. The associated complexity of the contracts and rigid rules for tendering could be an obstacle for establishing a PPI but also for upscaling the innovation afterwards. Similarly, rules and bureaucracy associated with EU-funded projects can pose a barrier for actors to join a partnership. Due to the complexity of contractual agreements and the regulatory environment, legal knowledge and counseling are needed to facilitate the collaboration.

How to Design Public-Private Innovation Partnerships

The four layers of our analysis allowed us to understand the concept of PPIs and their implementation in practice. It provided us with knowledge about the complexity and dynamics of PPIs and we were able to identify various enablers for and barriers to innovative outcomes. Therefore, our findings provided us with the implications for how to design public-private innovation partnerships, particularly in the waste management sector.

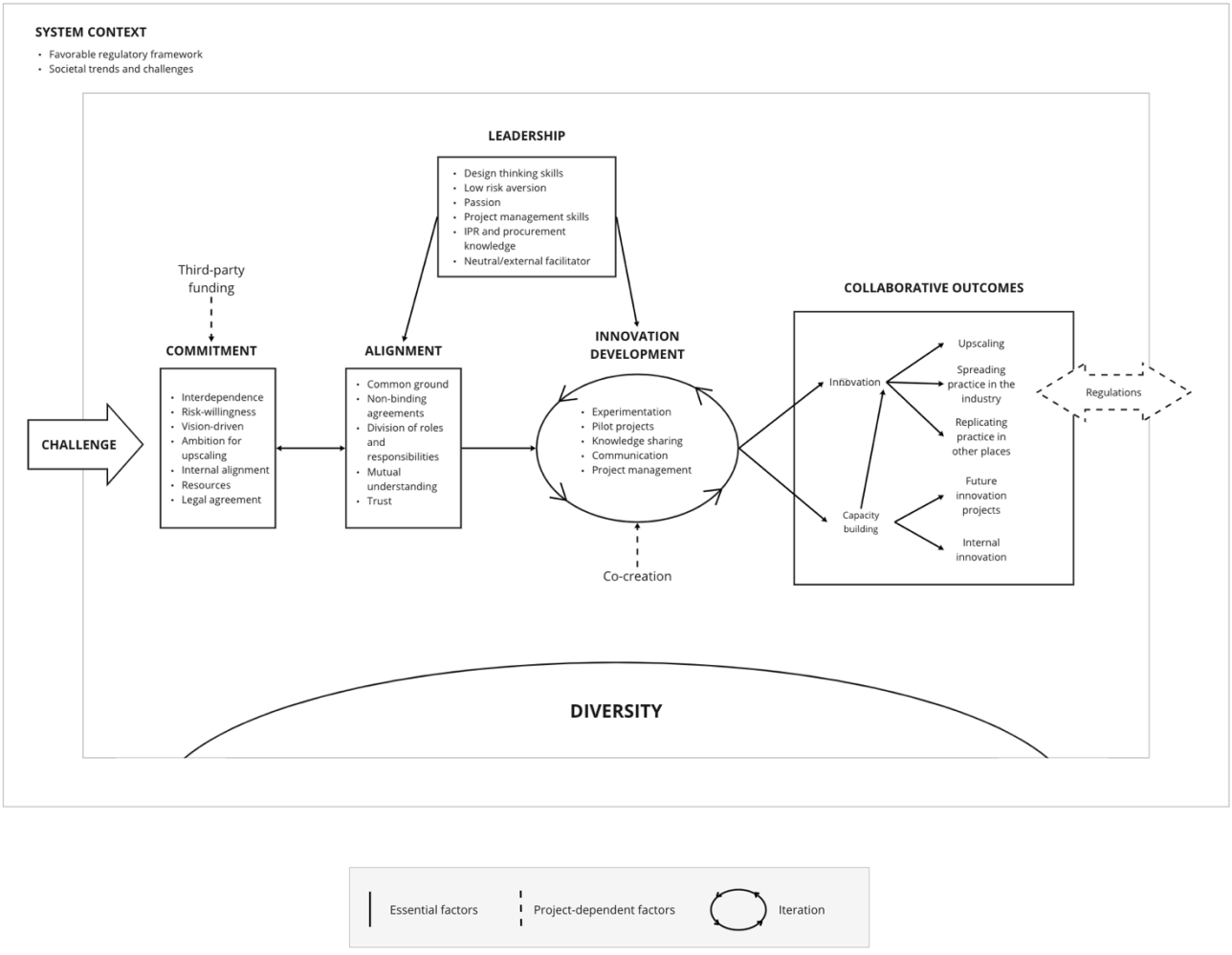


Figure 16: PPI Framework. Own illustration.

Our data interpretation thus led us to create a PPI framework that shows the factors that impact the innovative outcomes of the partnerships (see Figure 16). The factors shown in the model represent enablers for innovative outcomes in PPIs, while their absence is considered to create a barrier to innovation.

We clustered the factors into six dimensions: *commitment, alignment, leadership, innovation development, system context*, and *collaborative outcomes*. Besides the *system context*, all the other dimensions are situated within the course of a PPI, starting with a *challenge* that needs to be solved, and influenced by *diversity*, an overarching driver for innovation, stemming from the inherent multidisciplinary nature of PPIs and impacting a partnership throughout its entire existence. The *system context* provides a framework that enables the existence of PPIs and shapes their form and concentration. This means the other dimensions build on the *system context*. In the process of developing and implementing a PPI, the other dimensions gradually build on each other – for instance, without implementing enablers from the *alignmen*t dimension, the *innovation development* is unlikely to be successful – which is visually represented by the solid arrows connecting the dimensions. The dimensions *commitment* and *alignment* are connected with a double-headed arrow, representing the mutual influence they have on each other and the possibility of their overlapping in the PPI process.

The cyclical arrows surrounding the *innovation development* dimension represent the *iterative nature* of the innovation process in PPIs. The factors connected to the framework with dashed arrows represent enablers that are project-dependent. We argue that including *co-creation* would not necessarily enhance innovation in every type of PPI, e.g., in projects focusing on technological processes in the waste management sector. Nevertheless, PPIs in other sectors, such as social services and health care sectors, might have a more inherent user focus, amplifying the importance of co-creation in the innovation process. *Third-party funding* is not always present in partnerships, and thus, in some cases, might not be necessary for driving innovative outcomes. Similarly, only in some cases will upscaling or dissemination of innovation require novel *regulations* or be hindered by the existing ones.

The *system context* combines the global theme of regulatory and legal context with the human-centered organizing theme of societal trends. A *favorable regulatory framework* is essential for both allowing the establishment of PPIs as well as upscaling or replicating the solution. For innovation to arise from PPIs, it is imperative that the boundaries provided by the regulatory framework are clear, yet flexible. According to our findings, the purpose behind establishing individual PPIs lies in the current *societal trends and challenges*, which make the innovative outcomes relevant and valuable and provide an argument for including societal stakeholders in the process.

The *commitment* dimension includes factors that lead public and private actors to commit to a PPI as well as factors that substantiate their commitment. The notion of *interdependence*, originating in one of the organizing themes in our analysis, makes the actors seek out collaboration in the first place, while their *risk-willingness* and *vision-driven* attitude enable them to engage in an innovation-

oriented partnership, characterized by uncertain outcomes and unpredictable time horizons. Nevertheless, in our analysis, it becomes clear that the private sector is not only *vision-driven* but also profit-driven, seeking to turn the PPIs into positive business cases. It is thus suggested that establishing an *ambition for upscaling* is a driver for the private sector to join PPIs. Another organizing theme from our analysis, *internal alignment*, representing the positioning of a PPI within the individual partner organizations and the coordination with their internal strategies, enhances the commitment of the partners to the project, potentially increasing its success. As PPIs tend to be rather resource-intensive, contributing with different *resources* confirms the partners' commitment, which is further anchored in the *legal agreement*.

The dimension *alignment* corresponds to one of the seven global themes in our analysis. It emphasizes the importance of having an early alignment on the objectives and the vision of a partnership, building a *common ground* between the partners at the beginning of the process. According to our findings, establishing those aspects of a PPI in a *non-binding agreement* (a manifesto or a charter) rather than in a contract is beneficial for the development of the partnership. Furthermore, it is necessary to clarify the *division of roles and responsibilities* from the very start, especially if there are competitors present in the partnership. Without *trust* between the partners, a PPI is likely to lack its essential components: collaboration and knowledge sharing. As found in our analysis, trust-building is enabled by *mutual understanding* of the individual partners' values, underlying objectives and ways of working, which can be transferred to the partnership from previous experience of collaboration.

The *innovation development*, characterized by its *iterative nature*, inherently requires collaborative *project management*, typically facilitated by the PPI's initiator, and constant *communication* between the partners. The innovative outcomes then mostly build on the ongoing *knowledge sharing* and *experimentation*. *Pilot projects* are essential in determining the practical feasibility of the proposed innovative solutions in the specific context.

Both *alignment* and *innovation development* require a facilitator with the right skills to lead the PPI process, which are presented in the *leadership* dimension. Besides general *project management skills*, PPIs demand specific kinds of expertise and traits. Due to the uncertainty of innovation processes, the ideal leader is characterized by *passion* and *low risk aversion*. In our analysis, it becomes clear that in order to drive innovation processes, the leader should possess *design thinking skills*. If those are not in place, they might be brought into the PPI by an *external facilitator*, who might also better manage the process in relation to the differences between the partners' individual objectives. However, it is not necessary to bring in an external facilitator if the leader within the partnership,

typically from the public sector, is able to act as a *neutral facilitator*. According to our findings, due to the complexity of PPI agreements, the leader would benefit from *IPR and procurement knowledge*, assisting in navigating the innovative process in accordance with the existing regulations.

The *collaborative outcomes* encompass both results of a partnership but also enablers for implementing the developed innovative solutions in practice and for establishing future innovation projects. Without them, the *innovation* might never go beyond the PPI or the given pilot project. To ensure that the *innovation* provides the desired added value, the partners should, together with more stakeholders, opt either for *upscaling*, *spreading the practice in the industry* or *replicating the practice in other places*. Our analysis reveals that the actual innovative solution developed in a PPI is not the only innovative outcome – the innovation capacity built in the individual organizations as well as in the entire value chain might be just as important. This *capacity building* not only enables the partners to upscale, spread or replicate the innovative solution, but it also provides a basis for *future innovation projects* and *internal innovation*.

Discussion

Theoretical Implications

From the exploration of our findings in combination with the reviewed literature about PPIs, it becomes apparent that the PPI research field requires a cross-disciplinary approach, complementing the knowledge about collaborative governance and PPPs with insights from innovation studies. We argue that without combining the disciplines, the understanding of PPIs will remain limited and PPI research will fail to provide implications for practitioners. Consequently, that might lead to not realizing the added value of the partnerships and to implementing general PPPs without any innovative outcomes.

In our analysis, we identify several aspects of PPIs that are overlooked in the reviewed literature. The role of citizens, co-creation and external communication have not been studied in relation to PPIs. Furthermore, the influence of societal trends and challenges as well as non-financial motives of the partners have been neglected. For the collaborative process itself, there is a lack of research about the role of experimentation, iteration and upscaling in PPIs. Moreover, while knowledge sharing is not given much attention in the reviewed literature, our case study suggests it is an essential aspect of successful PPIs. In terms of the skills of a partnership's facilitator, design thinking represents a concept that is emphasized in our findings but not studied in the PPI literature. Two other important themes in our data that are overlooked in the reviewed literature are the role of external consultants and the impact of third-party funding (e.g., EU funding) on PPIs. From those aspects that are neglected in PPI literature, it is clear that a cross-disciplinary research approach is needed in studying PPIs.

For this reason, we perceive the use of our analytical framework, combining the framework for collaborative governance by Emerson et al. (2012) and the Double Diamond framework for innovation by Design Council (2015), as useful for studying PPIs. However, based on our analysis of the PPI projects, expert views on PPIs, and PPI research, we have been able to create a framework more suitable for studying PPIs. Just like in the analytical framework, the components of our developed PPI framework build on each other. Furthermore, several components of our framework overlap with the dimensions of the analytical framework. Our dimensions *system context*, *commitment* and *alignment* partially correspond to the dimensions *system context*, *principled engagement*, *shared motivation* and *capacity for joint action* of the analytical framework. However, within the dimensions, we identify somewhat different factors, relevant specifically for PPIs and not just collaborative governance in general.

Although the principles of the Double Diamond framework, *collaboration*, *communication*, *human-centered approach* and *iteration*, all proved to be relevant for PPIs, we argue that the framework in its original form is not entirely suitable for the PPI process. Firstly, the *discover* and *define* phases of the Double Diamond are, in PPIs, in part conducted internally in the initiating organization before moving on to the collaboration. Secondly, the *develop* and *deliver* phases correspond to the *innovation development* part of our PPI framework but do not go beyond the development to upscaling or applying the learnings in the future. Nevertheless, similarly to the analytical framework, the PPI framework emphasizes the iterative nature of the process in the innovation development phase. Corresponding to the *collaborative outcomes* of the analytical framework, our PPI framework also emphasizes the reciprocal relationship between the *collaborative outcomes* and the *system context*. However, the PPI framework puts more emphasis on the outcomes and the actions that need to be taken after the partnership ends to preserve and apply the developed innovation.

In conclusion, we argue that the contribution of our case study in the form of the PPI framework provides an analytical framework better suited for studying the specific form of collaboration that is public-private innovation partnerships. The framework addresses both the presence of the public and private sectors as well as the innovation objectives. It takes into consideration the uncertain and risky nature of innovation processes and highlights the importance of diversity, including not only public and private actors but also societal stakeholders. Although the framework is drawn from a case study in the waste management sector, it is flexible enough to be adjusted and implemented in other sectors as well.

Practical Implications

The created PPI framework allows practitioners to design partnerships in a way that drives the development of innovative solutions. Our research results affirm PPIs as a suitable approach for improving waste management practices. With regard to the developed PPI framework, we provide four main practical implications for PPIs in the waste management sector.

First of all, practitioners need to be aware that several factors that are identified as enablers for innovative outcomes in the PPI framework could also increase the complexity of the collaboration. If the partners fail to manage these factors carefully, they run the risk of turning them into barriers to innovation. This is especially important for the following four aspects. Firstly, the inclusion of competitors in a PPI project is, on one hand, an enabler for innovation because it amplifies the diversity of the partnership. On the other hand, it also increases the complexity regarding knowledge sharing among the partners and could lead to tension in the partnership. Secondly, while the engagement of

citizens through co-creation enhances diversity as well and brings valuable insights into the partnership, it also increases the complexity because it requires further resources, alignment, skills and additional time. Thus, if the partners fail to implement co-creation in a structured manner, it might also turn from an enabling factor into a barrier to innovation development. Thirdly, while legal agreements are a crucial element for building commitment and, therefore, allow for innovation development, it could also be discouraging for the stakeholders to join a partnership if the contractual setup is too rigid. Lastly, third-party funding opportunities, on one hand, make it easier for SMEs and startups to join PPIs. On the other hand, they also come with additional obligations for the partners, such as reporting requirements, and add another stakeholder to the partnership whose needs and interests need to be considered. Moreover, third-party funding might attract partners with lower commitment, driven by the funding opportunity rather than the real need. Therefore, third-party funding opportunities could be at risk of turning from enablers to innovation barriers as well.

A second practical implication is provided regarding the role of citizens. Similarly to the reviewed PPI literature, where the role of citizens is often overlooked, the waste management sector appears to be primarily technology-driven and lacks the citizens' perspective. However, in striving for circularity in waste management, the sector would benefit from a more human-centered approach by considering citizens as an integral part of the value chain. Furthermore, the studied partnership projects focus mostly on *recycling* of materials. However, to reach circularity, *reducing* waste, as well as *reusing* and *recovering* materials, which can be related to the consumption behavior of individuals, would also need to be considered.

Our third practical implication is intended to address the public sector. As already outlined at the beginning of this thesis and according to our findings, the waste management sector is highly regulated by local governments. Practitioners are dependent on regulatory frameworks that allow for innovation development in waste management. Extended producer responsibility, which appears to have a large relevance in the partnerships of our case study, is one example of the regulations that need to be addressed by governments to create a favorable environment for PPIs.

The provided practical implications are all relevant for our case organization, Circular Copenhagen. To reach circularity, the platform should adopt projects that together cover all the pillars of circular economy – reduce, reuse, recover and recycle. The interviews with the partners reveal that the municipality of Copenhagen holds all the predispositions, such as risk willingness, resources, and a strong commitment, to build an innovation ecosystem. Especially the test facilities at Amager Ressourcecenter, provide a unique possibility to develop and test innovative solutions. Thus, the

municipality should efficiently use their capacity and share their best practices with smaller municipalities in Denmark, whose capabilities might be insufficient. Besides sharing their practices, a closer collaboration in general with other Danish municipalities would be necessary to reach circularity on a large scale.

Limitations and Further Research

We suggest that the effectiveness of the developed PPI framework should be tested in future PPI projects and evaluated by researchers. Furthermore, the impact of each of the presented enablers on the innovative outcomes of PPIs might be determined using quantitative research methods. The different factors in the PPI framework might have a different impact on the various forms of innovative outcomes that were identified in the context of PPIs throughout the analysis, such as product, service, process or supply chain innovation. However, the scope of our research did not allow us to further examine how the impact of the enablers differs in regard to the various forms of innovative outcomes. Therefore, we propose that further research is needed to identify this relation to enable a more efficient design of PPIs based on their specific objectives and the desired innovative outcomes.

We also suggest for future research to investigate the role of research institutions in PPIs, which have been underrepresented in the studied partnerships. Moreover, there is a need for a better understanding of the influence of politics on the implementation of PPIs. Also, even though our research addresses the importance of human-centeredness and elaborates on the role of citizens in PPIs, the next step would be to investigate how to develop more inclusive innovation-oriented public-private-people partnerships.

As previously described in our methodological limitations, the reliability of our findings is ensured by implementing a transparent research approach. Furthermore, the generalizability of our research outcomes is achieved through relating our data to existing theory, which demonstrates the broader significance of our findings beyond the case study. Therefore, the developed PPI framework might be generalized and applied in various sectors. However, since the scope of this master thesis is limited to the Danish waste management context, some of the factors might be less relevant for other sectors and regions. For this reason, we propose testing and adjusting the framework to serve its purpose in other sectors and countries.

Conclusion

This master thesis aimed to investigate how public-private innovation partnerships need to be designed to drive innovative outcomes. Our research approach was based on a qualitative analysis of a case study on PPIs focused on waste management in Copenhagen. Through the study of relevant literature, semi-structured interviews with partners from the projects and external experts, as well as secondary data about the projects and the waste management sector, we have been able to understand the concept of PPIs, their practical implementation, and what the enablers for and barriers to innovative outcomes in PPIs are.

Based on those findings, our master thesis shows that public-private innovation partnerships should be designed with specific considerations regarding several project dimensions. Firstly, the establishment of PPIs is contingent on the surrounding *system context*, including a *favorable regulatory framework,* and *societal trends and challenges*. Secondly, the partnerships need be built on *commitment* and substantial *alignment* between the partners, paving the way for iterative *innovation development.* Thirdly, PPIs require *leadership* that can enhance innovative outcomes through design thinking, manage the different characteristics and objectives of the public and private actors, and navigate the complex regulatory landscape. Lastly, in designing PPIs, the partners' ambitions should go beyond the innovation development by considering the possible *upscaling, spreading or replicating of the solution*, using the *internal capacity* built throughout the process itself. Furthermore, *diversity* represents a central and overarching driver for innovation in PPIs, encouraging the inclusion of a variety of public and private actors as well as citizens.

Tying our research findings together, we have developed a PPI framework presenting the interrelated dimensions that incorporate the specific factors that drive innovative outcomes in PPIs. Practitioners designing PPIs are encouraged to pay particular attention to the specific factors as they represent enablers of innovative outcomes while their absence might pose a barrier to reaching innovative solutions. Furthermore, some of the factors, such as co-creation with citizens, third-party funding, legal agreements and the inclusion of competitors, increase the complexity of the collaboration and might turn into barriers if not carefully managed.

The developed PPI framework contributes as the first step towards a cross-disciplinary approach in PPI research, combining the knowledge from PPP/PPI and collaborative governance literature with concepts from innovation studies. We argue that this cross-disciplinary approach is necessary for understanding the nature of public-private innovation partnerships and, consequently, for designing them in a way that drives innovative outcomes.

Particularly in the waste management sector, the implementation of PPIs might require regulatory changes transferring parts of the local government's authority to the private actors taking responsibility for their waste. Furthermore, the traditionally technology-driven waste management sector could benefit from adopting a more human-centered perspective, for example, through including societal stakeholders in PPIs. Concluding our master thesis, we are confident that PPIs in the waste management sector designed to create added value for society and the environment have the potential to contribute to a more sustainable urban development.

References

Aage Vestergaard Larsen [AVL]. (2021, March 19). *Interview with Bo Jacobsen*, pp. 2-20 of Appendix B.

Adner, R. (2006). Match your innovation strategy to your innovation ecosystem. *Harvard Business Review, 84*(4), 98-107.

Ahmed, S. A., & Ali, S. M. (2006). People as partners: Facilitating people's participation in public–private partnerships for solid waste management. *Habitat International, 30*(4), 781-796. https://doi.org/10.1016/j.habitatint.2005.09.004

Alimi, D., Izdebska, O., Klindworth, K., Tortelli, C., & Camara C. (2019). *D7.1: Analysis of cooperation structures, processes and policy instruments*. FORCE. https://drive.google.com/file/d/1XV8Oobb4KbAqevhWv7nIzp-euJquEoLw/view?usp=sharing

Amabile, T. M. (1988). A model of creativity and innovation in organizations. *Research in Organizational Behavior, 10*(1), 123–167.

Amager Ressourcecenter [ARC]. (2021, March 22). *Interview with Ida Leisner*, pp. 21-28 of Appendix B.

Ansell, C., & Gash, A. (2008). Collaborative governance in theory and practice. *Journal of Public Administration Research and Theory, 18*(4), 543–571. https://doi.org/10.1093/jopart/mum032

Arlbjørn, J. S., de Haas, H., & Munksgaard, K. B. (2011). Exploring supply chain innovation. *Logistics Research*, *3*(1), 3-18. https://doi.org/10.1007/s12159-010-0044-3

Attride-Stirling, J. (2001). Thematic networks: An analytic tool for qualitative research. *Qualitative Research, 1*(3), 385–405. https://doi.org/10.1177/146879410100100307

Awortwi, N. (2004). Getting the fundamentals wrong: Woes of public–private partnerships in solid waste collection in three Ghanaian cities. *Public Administration and Development: The International Journal of Management Research and Practice*, *24*(3), 213-224. https://doi.org/10.1002/pad.301

Bason, C. (2018). *Leading public sector innovation: Co-creating for a better society* (2nd ed.). Policy Press.

Bekendtgørelse om affald, BEK nr 2159 af 09/12/2020 (2020). https://www.retsinformation.dk/eli/lta/2020/2159

Bossink, B. (2013). *Eco-innovation and sustainability management.* Routledge.

Boström, A. K. (2020, June 30). *Our perspective: Can you recycle an insulin pen?*. Novo Nordisk. https://www.novonordisk.com/sustainable-business/zero-environmental-impact/can-you-recycle-an-insulin-pen.html

Brinkerhoff, D. W., & Brinkerhoff, J. M. (2011). Public–private partnerships: Perspectives on purposes, publicness, and good governance. *Public Administration and Development, 31*(1), 2-14. https://doi.org/10.1002/pad.584

Brinkmann, S., & Kvale, S. (2005). Confronting the ethics of qualitative research. *Journal of Constructivist Psychology, 18*(2), 157–181. https://doi.org/10.1080/10720530590914789

Brinkmann, S. (2013). *Qualitative interviewing: Understanding qualitative research*. Oxford University Press.

Brinkmann, S., & Kvale, S. (2015). *Interviews: Learning the craft of qualitative research interviewing* (3rd ed.). Sage.

Brogaard, L., & Petersen, O. H. (2014). *Offentlige-private innovationspartnerskaber (OPI): Evaluering af erfaringer med OPI på velfærdsområdet*. KORA – Det nationale institut for kommuners og regioners analyse og forskning. https://rucforsk.ruc.dk/ws/portalfiles/portal/53904790/offentlige_private_innovationspartnerskaber_opi.pdf

Brogaard, L. (2017). The impact of innovation training on successful outcomes in public–private partnerships. *Public Management Review, 19*(8), 1184–1205. https://doi.org/10.1080/14719037.2016.1272710

Brogaard, L. (2021). Innovative outcomes in public-private innovation partnerships: a systematic review of empirical evidence and current challenges. *Public Management Review, 23*(1), 135–157. https://doi.org/10.1080/14719037.2019.1668473

Brown, T. (2008). Design thinking. *Harvard Business Review, 86*(6), 84–95.

Brown, T., & Katz, B. (2009). *Change by design: How design thinking transforms organizations and inspires innovation.* HarperCollins.

Carbonara, N., & Pellegrino, R. (2020). The role of public private partnerships in fostering innovation. *Construction Management and Economics, 38*(2), 140–156. https://doi.org/10.1080/01446193.2019.1610184

Circular Copenhagen. (n.d.). *What is Circular Copenhagen?*. Retrieved February 5, 2021, from https://circularcph.cphsolutionslab.dk/cc/home

Circular Copenhagen. (2020a, August 10). *Partnership for circular food trays*. https://circularcph.cphsolutionslab.dk/cc/partnerships/partnership-for-circular-food-trays

Circular Copenhagen. (2020b, November 5). *Partnership for circular insulin pens - Returpen.dk (TM).* https://circularcph.cphsolutionslab.dk/cc/partnerships/partnership-for-circular-insulin-pensh

Circular Copenhagen [CC]. (2021a, January 28). *Interview 1 with Jonas Åbo Mortensen*, pp. 39-53 of Appendix B.

Circular Copenhagen [CC]. (2021b, February 16). *Interview 2 with Jonas Åbo Mortensen*, pp. 54-68 of Appendix B.

Circular Copenhagen [CC]. (2021c, March 17). *Interview 3 with Jonas Åbo Mortensen*, pp. 69-90 of Appendix B.

Circular Copenhagen [CC]. (2021d, March 25). *Interview 4 with Jonas Åbo Mortensen*, pp. 91-109 of Appendix B.

Coop Danmark. (2021, April 12). *Interview with Mathias Hvam*, pp. 110-127 of Appendix B.

Crossan, M. M., & Apaydin, M. (2010). A multi-dimensional framework of organizational innovation: A systematic review of the literature. *Journal of Management Studies, 47*(6), 1154–1191. https://doi.org/10.1111/j.1467-6486.2009.00880.x

Cunliffe, A. L. (2008). Orientations to social constructionism: Relationally responsive social constructionism and its implications for knowledge and learning. *Management Learning, 39*(2), 123–139. https://doi.org/10.1177/1350507607087578

C40 Cities. (n.d.). *Waste to Resources: Network overview*. https://www.c40.org/networks/waste-to-resources

C40 Cities [C40]. (2021, March 10). *Interview with Kathrin Zeller*, pp. 241-257 of Appendix B.

Danmarks Apotekerforening. (2021, March 11). *Interview with Birthe Søndergaard*, pp. 128-143 of Appendix B.

Dansk Teknologisk Institut [DTI]. (2021, March 7). *Interview with Bjørn Malmgren-Hansen*, pp. 144-163 of Appendix B.

Davila, T., Epstein, M. J., & Shelton, R. (2006). *Making innovation work: How to manage it, measure it, and profit from it.* Wharton School Publishing.

Design Council. (2015, March 17*). What is the framework for innovation? Design Council's evolved Double Diamond.* https://www.designcouncil.org.uk/news-opinion/what-framework-innovation-design-councils-evolved-double-diamond

Diabetesforeningen. (2021, March 22). *Interview with Thomas Elgaard Larsen*, pp. 164-177 of Appendix B.

Distribution Denmark. (2021, March 18). *Interview with Trine Hansen*, pp. 178-194 of Appendix B.

Dittmer, M. A., Christiansen, C., & Kierkegaard, G. F. (2009). Denmark: Public private partnership for Innovation (PPPI) in Denmark. *European Public Private Partnership Law Review, 4*(4), 240–242.

Dyer, J., Gregersen, H., & Christensen, C. M. (2011). *The innovator's DNA: Mastering the five skills of disruptive innovators*. Harvard Business Press.

Eaton, D., Akbiyikli, R., & Dickinson, M. (2006). An evaluation of the stimulants and impediments to innovation within PFI/PPP projects. *Construction Innovation, 6*(2), 63–67. https://doi.org/10.1108/14714170610710668

Eggers, W. D., & Singh, S. K. (2009). *The public innovator's playbook: Nurturing bold ideas in government.* Deloitte Research. https://www.innovations.harvard.edu/sites/default/files/553487.pdf

EIT Climate-KIC Nordic. (n.d.). *What is EIT Climate-KIC Nordic? We are Europe's leading climate innovative initiative*. https://nordic.climate-kic.org/who-we-are/about-us/

EIT Climate-KIC Nordic [EIT]. (2021, March 10). *Interview with Jakob Stolt*, pp. 258-278 of Appendix B.

Ellen MacArthur Foundation. (n.d.). *What is the circular economy?*. https://www.ellenmacarthurfoundation.org/circular-economy/what-is-the-circular-economy

Ellen MacArthur Foundation. (2015). *Delivering the circular economy: A toolkit for policymakers*. https://www.ellenmacarthurfoundation.org/assets/downloads/publications/EllenMacArthurFoundation_PolicymakerToolkit.pdf

Ellen MacArthur Foundation. (2021). *Universal circular economy policy goals: Enabling the transition to scale*. https://emf.thirdlight.com/link/kt00azuibf96-ot2800/@/preview/1?o

Emerson, K., Nabatchi, T., & Balogh, S. (2012). An integrative framework for collaborative governance. *Journal of Public Administration Research and Theory*, *22*(1), 1-29. https://doi.org/10.1093/jopart/mur011

Esposito, M., Tse, T., & Soufani, K. (2018). Introducing a circular economy: New thinking with new managerial and policy implications. *California Management Review, 60*(3), 5–19. https://doi.org/10.1177/0008125618764691

European Commission. (2020, November 26). *Cities cooperating for circular economy*. https://cordis.europa.eu/project/id/689157/de

European Parliamentary Research Service [EPRS]. (2018, December). *Circular economy*. https://www.europarl.europa.eu/thinktank/infographics/circulareconomy/public/index.html

Eurostat. (2021, February 16). *Municipal waste by waste management operations*. Retrieved February 20, 2021, from http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=env_wasmun&lang=enhttp://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=env_wasmun&lang=en

Evald, M. R., Nissen, H. A., Clarke, A. H., & Munksgaard, K. B. (2014). Reviewing cross-field public private innovation literature: Current research themes and future research themes yet to be explored. *International Public Management Review, 15*(2).

FORCE Consortium. (n.d.). *Plastic waste*. FORCE project. http://www.ce-force.eu/pages/city-of-copenhagen--plastic-waste_52790691.php

Forsyth, T. (2005). Building deliberative public–private partnerships for waste management in Asia. *Geoforum*, *36*(4), 429-439. https://doi.org/10.1016/j.geoforum.2004.07.007

Friedrichs, J., & Kratochwil, F. (2009). On acting and knowing: How pragmatism can advance international relations research and methodology. *International Organization, 63*(3), 701–731. https://www.jstor.org/stable/40345953

Hodge, G. A., & Greve, C. (2007). Public–private partnerships: An international performance review. *Public Administration Review, 67*(3), 545-558. https://doi.org/10.1111/j.1540-6210.2007.00736.x

Hodge, G., & Greve, C. (2013). Introduction: Public-private partnership in turbulent times. In C. Greve & G. Hodge (Eds.), *Rethinking public-private partnerships: Strategies for turbulent times* (pp. 1-32). Routledge. https://doi.org/10.4324/9780203108130

Hodge, G., Greve, C., & Biygautane, M. (2018). Do PPP's work? What and how have we been learning so far?. *Public Management Review, 20*(8), 1105-1121. https://doi.org/10.1080/14719037.2018.1428410

Hoornweg, D., & Bhada-Tata, P. (2012). *What a waste: A global review of solid waste management*. World Bank. https://openknowledge.worldbank.org/handle/10986/17388

Huxham, C., & Vangen, S. (2000). What makes partnerships work?. In S. P. Osborne (ed.), *Public-private partnerships: Theory and practice in international perspective* (pp. 293-310). Routledge.

Ibitayo, O. O. (2002). Public-private partnerships in the siting of hazardous waste facilities: The importance of trust. *Waste Management & Research: The Journal for a Sustainable Circular Economy*, *20*(3), 212-222. https://doi.org/10.1177/0734242X0202000302

IHP Systems. (n.d.). *Enabling the circular plastics economy*. Retrieved February 5, 2021, from https://ihp.dk

IHP Systems. (2021, March 22). *Interview with Lars Mensal*, pp. 195-206 of Appendix B.

Indén, T., & Olesen, K. N. (2012). Legal aspects of public private innovation. *European Procurement & Public Private Partnership Law Review, 7*(4), 258-267. https://www.jstor.org/stable/26694413

International Resource Panel [IRP]. (2018). *The weight of cities: Resource requirements of future urbanization.* United Nations Environment Programme. https://www.resourcepanel.org/reports/weight-cities

Jeffares, S., Sullivan, H., & Bovaird, T. (2013). Beyond the contract: The challenge of evaluating the performance(s) of public-private partnerships. In C. Greve & G. Hodge (Eds.), *Rethinking public-private partnerships: Strategies for turbulent* (pp. 166-187). Routledge. https://doi.org/10.4324/9780203108130

Kahn, K. B. (2018). Understanding innovation. *Business Horizons, 61*(3), 453–460.

Kelemen, M. L., & Rumens, N. (2008). *An Introduction to Critical Management Research*. Sage.

Kirchherr, J., Reike, D., & Hekkert, M. (2017). Conceptualizing the circular economy: An analysis of 114 definitions. *Resources, Conservation and Recycling, 127*, 221–232. https://doi.org/10.1016/j.resconrec.2017.09.005

Klijn, E. H., & Teisman, G. R. (2003). Institutional and strategic barriers to public-private partnership: An analysis of Dutch cases. *Public Money & Management, 23*(3), 137–146. https://doi.org/10.1111%2F1467-9302.00361

Klijn, E. H. (2010). Public private partnerships: deciphering meaning message and phenomenon. In G. Hodge, C. Greve & A. E. Boardman (Eds*.), International handbook on public-private partnerships* (pp. 68-80). Edward Elgar.

Klijn, E. H., & Koppenjan, J. (2016). The impact of contract characteristics on the performance of public–private partnerships (PPPs). *Public Money & Management, 36*(6), 455–462. https://doi.org/10.1080/09540962.2016.1206756

Konkurrence- og Forbrugerstyrelsen. (2020, December 10). *Typer af offentlig-privat samarbejde*. Retrieved March 17, 2021, from https://www.kfst.dk/udbud/offentlig-privat-samarbejde/typer-af-offentlig-privat-samarbejde/

Københavns Kommune. (n.d.). *Teknik- og Miljøforvaltningen*. Retrieved February 5, 2021, from https://www.kk.dk/artikel/teknik-og-miljøforvaltningen

Københavns Kommune. (2019). *Circular Copenhagen: Resource and waste management plan 2024.* https://kk.sites.itera.dk/apps/kk_pub2/index.asp?mode=detalje&id=1991

Kruljac, S. (2012). Public–private partnerships in solid waste management: Sustainable development strategies for Brazil. *Bulletin of Latin American Research*, *31*(2), 222-236. https://doi.org/10.1111/j.1470-9856.2011.00659.x

Leaderlab. (n.d.). *Uniting the builders of tomorrow*. Retrieved March 9, 2021, from https://leaderlab.com

Leaderlab. (2021, March 4). *Interview with Toke Sabroe*, pp. 279-297 of Appendix B.

Lember, V., Petersen, O. H., Scherrer, W., & Ågren, R. (2019). Understanding the relationship between infrastructure public–private partnerships and innovation. *Annals of Public and Cooperative Economics, 90*(2), 371–391. https://doi.org/10.1111/apce.12232

Lewrick, M., Link, P., & Leifer, L. J. (2020). *The design thinking toolbox: A guide to mastering the most popular and valuable innovation methods*. John Wiley & Sons.

Li, B., & Akintoye, A. (2003). An overview of public-private partnership. In A. Akintoye, M. Beck & C. Hardcastle (Eds.), *Public-private partnerships: Managing risks and opportunities* (pp. 3-30). Blackwell.

Liedtka, J., & Ogilvie, T. (2011). *Designing for growth, a design thinking tool kit for managers*. Columbia University Press.

Liedtka, J. (2015). Perspective: Linking design thinking with innovation outcomes through cognitive bias reduction. *Journal of Product Innovation Management, 32*(6), 925–938. https://doi.org/10.1111/jpim.12163

Marshall, C., & Rossman, G.B. (2006). *Designing qualitative research* (4th ed.). Sage.

Marsilio, M., Cappellaro, G., & Cuccurullo, C. (2011). The intellectual structure of research into PPPS: A bibliometric analysis. *Public Management Review, 13*(6), 763–782. https://doi.org/10.1080/14719037.2010.539112

Massoud, M. A., & El-Fadel, M. (2002). Public–private partnerships for solid waste management services. *Environmental Management*, *30*(5), 621-630. https://doi.org/10.1007/s00267-002-2715-6

Miljøstyrelsen. (n.d.). *Miljøbeskyttelsesloven*. Retrieved February 13, 2021, from https://mst.dk/affald-jord/affald/indsamleruddannelsen/affaldsregulering/miljoebeskyttelsesloven/

Moore, M., & Hartley, J. (2008). Innovations in governance. *Public Management Review, 10*(1), 3–20. https://doi.org/10.1080/14719030701763161

Mortensen, J. Å. (2018). *Projektbeskrivelse til indsats 4.1 – innovationsplatform "Circular Copenhagen"* [Internal Document], pp. 316-327 of Appendix B.

Murray, V. (1998). Interorganizational collaborations in the nonprofit sector. In J. M. Shafritz (Ed.), *International encyclopedia of public policy and administration, Volume 2* (pp. 1192-1196). Routledge.

Nakata, C., & Hwang, J. (2020). Design thinking for innovation: Composition, consequence, and contingency. *Journal of Business Research, 118*, 117–128. https://doi.org/10.1016/j.jbusres.2020.06.038

Nederhand, J., & Klijn, E. H. (2019). Stakeholder involvement in public–private partnerships: Its influence on the innovative character of projects and on project performance. *Administration and Society, 51*(8), 1200–1226. https://doi.org/10.1177/0095399716684887

Nomeco. (2021, March 18). *Interview with Jane Wehlast*, pp. 207-218 of Appendix B.

Norman, D. A., & Verganti, R. (2014). Incremental and radical innovation: Design research vs. technology and meaning change. *Design issues, 30*(1), 78-96. https://doi.org/10.1162/DESI_a_00250

Novo Nordisk. (n.d.). *Zero environmental impact*. Retrieved February 20, 2021, from https://www.novonordisk.com/sustainable-business/zero-environmental-impact.html

Novo Nordisk. (2021, March 2). *Interview with Niels Otterstrøm Jensen*, pp. 219-240 of Appendix B.

OECD. (2016). *Extended producer responsibility: Updated guidance for efficient waste management*. https://www.oecd-ilibrary.org/sites/9789264256385-en/index.html?itemId=/content/publication/9789264256385-en&_csp_=655c3e342413dc3a65981a5ecd862ee5&itemIGO=oecd&itemContentType=book

OECD. (2020). *The circular economy in cities and regions: Synthesis report*. https://www.oecd-ilibrary.org/sites/10ac6ae4-en/index.html?itemId=/content/publication/10ac6ae4-en

Osborne, S. P., & Murray, V. (1998). *Voluntary and non‐profit organizations and the development of public services for local communities in Canada: An exploratory case study* (PSMRC Working Paper). Aston University, Birmingham.

Osborne, S. P., & Murray, V. (2000). Understanding the process of public-private partnerships. In S. P. Osborne (ed.), *Public-private partnerships: Theory and practice in international perspective* (pp. 70-83). Routledge.

Osborne, S. P. (2006). The new public governance?. *Public Management Review, 8*(3), 377–387. https://doi.org/10.1080/14719030600853022

Peters, B. G. (1998). 'With a little help from our friends': public-private partnerships as institutions and instruments. In J. Pierre (Ed.), *Partnerships in urban governance: European and American experiences* (pp. 11-33). Palgrave Macmillan. https://doi.org/10.1007/978-1-349-14408-2

Rangel, T., & Galende, J. (2010). Innovation in public-private partnerships (PPPs): The Spanish case of highway concessions. *Public Money and Management, 30*(1), 49–54. https://doi.org/10.1080/09540960903492380

REFLOW. (n.d.). *About Reflow: We need regenerative cities and a circular economy*. https://reflowproject.eu/about/

REFLOW EU Horizon 2020 project [REFLOW]. (2021, March 11). *Interview with Cristiana Parisi*, pp. 298-315 of Appendix B.

Returpen. (2020). *Din injektionspen er for god til at smide ud*. https://www.returpen.dk

Saunders, M., Lewis, P., & Thornhill, A. (2012). *Research methods for business students* (6th ed.). Pearson.

Schumpeter, J. (1934), *The theory of economic development*. Harvard University Press.

Scott, T. A., & Thomas, C. W. (2017). Unpacking the collaborative toolbox: Why and when do public managers choose collaborative governance strategies? *Policy Studies Journal, 45*(1), 191–214. https://doi.org/10.1111/psj.12162

Song, J., Zhang, H., & Dong, W. (2016). A review of emerging trends in global PPP research: analysis and visualization. *Scientometrics, 107*(3), 1111–1147. https://doi.org/10.1007/s11192-016-1918-1

Sørensen, E., & Torfing, J. (2011). Enhancing collaborative innovation in the public sector. *Administration & Society, 43*(8), 842–868. https://doi.org/10.1177/0095399711418768

Thomson, A. M., & Perry, J. L. (2006). Collaboration processes: Inside the black box. *Public Administration Review, 66*, 20–32. https://doi.org/10.1111/j.1540-6210.2006.00663.x

Torfing, J., & Triantafillou, P. (2016). Enhancing public innovation by transforming public governance?. In J. Torfing & P. Triantafillou (Eds.), *Enhancing public innovation by transforming public governance* (pp. 1–32). Cambridge University Press.

UN-Habitat. (2011). *Global report on human settlements 2011: Cities and climate change*. https://unhabitat.org/sites/default/files/download-manager-files/Cities and Climate Change Global Report on Human Settlements 2011.pdf

UN-Habitat. (2020). *World cities report 2020: The value of sustainable urbanization, key findings and messages*. https://unhabitat.org/sites/default/files/2020/10/key_messages_summary_english.pdf

United Nations. (2015). *Transforming our world: The 2030 agenda for sustainable development.* https://sdgs.un.org/sites/default/files/publications/21252030 Agenda for Sustainable Development web.pdf

United Nations, Department of Economic and Social Affairs [UNDESA]. (2019). World urbanization prospects 2018: Highlights. https://population.un.org/wup/Publications/Files/WUP2018-Highlights.pdf

Utterback, J. M. (1971). The process of technological innovation within the firm. *Academy of Management Journal, 14*(1), 75–88. https://doi.org/10.5465/254712

Utterback, J. M., & Abernathy, W. J. (1975). A dynamic model of process and product innovation. *Omega: The International Journal of Management Science, 3*(6), 639–656. https://doi.org/10.1016/0305-0483(75)90068-7

Van de Ven, A., Polley, D., Garud, S., & Venkataraman, S. (2007). *The innovation journey*. Oxford University Press.

Van Ham, H., & Koppenjan, J. (2001). Building public-private partnerships: Assessing and managing risks in port development. *Public Management Review, 3*(4), 593-616. https://doi.org/10.1080/14616670110070622

von Thienen, J., Meinel, C., & Nicolai, C. (2014). How design thinking tools help to solve wicked problems. In H. Plattner, C. Meinel, & L. Leifer (Eds.), *Design thinking research: Building innovation eco-systems* (pp. 97–102). Springer. https://doi.org/10.1007/978-3-319-01303-9

Wang, C. L., & Ahmed, P. K. (2004). Leveraging knowledge in the innovation and learning process at GKN. *International Journal of Technology Management, 27*(6-7), 674–88. https://doi.org/10.1504/IJTM.2004.004909

Wang, H., Xiong, W., Wu, G., & Zhu, D. (2018). Public–private partnership in public administration discipline: A literature review. *Public Management Review, 20*(2), 293–316. https://doi.org/10.1080/14719037.2017.1313445

Warsen, R., Nederhand, J., Klijn, E. H., Grotenbreg, S., & Koppenjan, J. (2018). What makes public-private partnerships work? Survey research into the outcomes and the quality of cooperation in PPPs. *Public Management Review, 20*(8), 1165-1185. https://doi.org/10.1080/14719037.2018.1428415

Warsen, R., Greve, C., Klijn, E. H., Koppenjan, J. F. M., & Siemiatycki, M. (2020). How do professionals perceive the governance of public–private partnerships? Evidence from Canada, the Netherlands and Denmark. *Public Administration, 98*(1), 124–139. https://doi.org/10.1111/padm.12626

Winkler, H. (2011). Closed-loop production systems – A sustainable supply chain approach. *CIRP Journal of Manufacturing Science and Technology, 4*(3), 243–246. https://doi.org/10.1016/j.cirpj.2011.05.001

Yescombe, E. R., & Farquharson, E. (2018). *Public-private partnerships for infrastructure: Principles of policy and finance*. Butterworth-Heinemann.

Yin, R. K. (2009). *Case study research: Design and methods* (4th ed.). Sage.

Ysa, T., Esteve, M., & Longo, F. (2013). Enhancing Innovation in public organizations through public-private partnerships: The role of public managers. In C. Greve & G. Hodge (Eds.), *Rethinking public-private partnerships: Strategies for turbulent times* (pp. 98-113). Routledge. https://doi.org/10.4324/9780203108130

Zhang, S., Chan, A. P. C., Feng, Y., Duan, H., & Ke, Y. (2016). Critical review on PPP research – A search from the Chinese and international journals. *International Journal of Project Management, 34*(4), 597–612. https://doi.org/10.1016/j.ijproman.2016.02.008

Appendix A

Table of Contents

List of Tables and Figures

Expert Interviewees

Through desktop research and mapping the waste management, circular economy and innovation sectors in Copenhagen, we identified various relevant experts in the fields of public-private partnerships, innovation, waste management and circular economy. Since the experts are not directly related to Circular Copenhagen or their specific innovation partnerships, they provided us with rather general insights and experiences. After reaching out and contacting numerous professionals, such as consultants and project managers, we eventually conducted interviews with the following experts:

- Kathrin Zeller: Senior manager of the *Waste to Resources Network* of the C40 Cities. The network supports cities in their transition from solid waste management to sustainable resource management (C40 Cities, n.d.).
- Jakob Stolt: Senior project manager at EIT Climate-KIC Nordic, which is the Nordic branch of a European innovation and knowledge community with the aim to reach a zero-carbon economy. The community convenes networks of expertise, leverages grants, develops capacities, and catalyzes innovation. Jakob is especially experienced in working with innovation, partnerships, leadership, and entrepreneurship (EIT Climate-KIC Nordic, n.d.).
- Toke Sabroe: partner at Leaderlab, which is a consultancy agency situated in BLOXHUB for establishing, facilitating, and operating collaboration and partnerships between organizations that drive sustainable solutions. Furthermore, Leaderlab offers advisory on sustainable innovation implementation and is facilitator of the *Circular Innovation City Challenge.* Toke is experienced in multi-stakeholder partnerships and projects and has worked with both, public and private entities (Leaderlab, n.d.).
- Cristiana Parisi: Associate Professor in Management Control at Copenhagen Business School and Coordinator of the EU Horizon 2020 REFLOW project. The REFLOW project has the aim to develop regenerative and circular cities by using fab labs and maker spaces in six different pilot cities across Europe. The project involves governments, businesses, and citizens (REFLOW, n.d.).

Innovation Partnerships

The following section entails a description of each of the three studied partnerships. In order to get a comprehensive understanding of the subject in each partnership, we chose a variety of interviewees from across the value chain.

Partnership for Circular Food Trays

Food trays comprise a significant amount of the total quantity of plastic waste of Copenhagen households. To reduce the downcycling of the trays, CC established a partnership with seven stakeholders from across the value chain: Amager Ressourcecenter (ARC), REMA 1000, Coop, Faerch Plast, Danish Crown, IHP Systems, and the City of Copenhagen. Together, they are collaborating towards six joint development goals:

1. close the loop for the recycling of plastic food trays in Copenhagen
2. support the design of food packaging in way that it can be recycled into new food packaging
3. establish new sorting technology solutions for carbon black food packaging
4. encourage citizens for enhanced separation of plastic waste
5. minimize expenses for recycling of plastic food packaging
6. drive forward the future producer responsibility scheme for food packaging (Circular Copenhagen, 2020a)

The involved partners assume different roles and responsibilities across the food trays value chain. The food processor Danish Crown uses the plastic trays for their meat packaging, which is then sold in the Danish retail stores REMA1000 and Coop. The used plastic trays are collected with other plastic waste from the citizens' households by the City of Copenhagen. Afterwards, the PET food trays are separated from the other plastic waste at ARC using a new sorting software, provided by IHP Systems. In collaboration with CC, IHP Systems developed a software for a sorting-robot which could identify black plastic (food) trays by color and shape with the help of image recognition and AI through digital watermarks. In the partnership project, the sorted trays had been transported to the Netherlands, where they had been washed and recycled into PET flakes. Subsequently, the plastic flakes were used by Faerch Plast in Denmark to produce new food trays (Circular Copenhagen, 2020a; IHP Systems, n.d.).

Returpen Partnership

Circular Copenhagen joined the Returpen partnership initiated and led by Novo Nordisk. The partnership aims for circular treatment of used insulin pens to ensure a responsible handling of the high-

quality materials (Circular Copenhagen, 2020b). The treatment of clinical waste often requires extra care but also exemplifies high recycling potential. Accordingly, Novo Nordisk pursues a zero environmental impact strategy, which is called *Circular for zero*. The strategy challenges the organization to “find new ways to design products that can be recycled or re-used, reshape [their] business to minimize consumption and waste, and work with suppliers who share [the same] goal” (Novo Nordisk, n.d.). The firm produces over 550 million insulin pens a year worldwide which consist mainly of plastic (77%) but also include glass and metal components (Boström, 2020). The company developed a machine that separates the used insulin pens back into different material waste components. Furthermore, Novo Nordisk experimented with potential reuse options of the disassembled insulin pen waste components: in collaboration with Danish design companies, chairs and lamps were designed using the plastic and glass components of the recycled insulin pens. Additionally, Novo Nordisk intends to rethink the way that they deliver the pens to the patients and, therefore, develops new delivery methods (Boström, 2020).

To recycle and reuse the used insulin pens, Novo Nordisk implemented a take-back system for the pens. In this master thesis, the investigation of the Returpen partnership focusses specifically on this take-back system, which is described in the following. New insulin pens are provided by Novo Nordisk and medical wholesalers and distributors like Nomeco and TMJ deliver the pens to the pharmacies, which are represented in this partnership by the Danmarks Apotekerforening. End users, the diabetes patients, can pick up their insulin pens at the pharmacies. The users are represented by the Diabetesforeningen and the Steno Diabetes Center. The used insulin pens are brought back to the pharmacies by the users where medical wholesalers and distributors pick them up, store them, and return them to Novo Nordisk. Hence, the used insulin pens are recycled and reassembled into their separate materials (Boström, 2020; Novo Nordisk, n.d.; Returpen, 2020).

The role of the City of Copenhagen, Aarhus and Kolding, is to provide the legal framework in terms of waste collection, including an exemption for Novo Nordisk to be able to collect the waste. CC facilitates the communication between the municipality of Copenhagen and the other partners and provides knowledge about collection schemes, waste management and public-private partnerships in general (CC, 2021c). From December 2020 on, the partners are testing the pilot take-back system for six months. Subsequently, the partners are planning to create a plant for the treatment of used insulin pens and to open it by summer 2021 in the Copenhagen area. With the insulin pen as an initial starting point, the partnership’s vision is to create an inclusive solution of waste treatment for further medical products (Circular Copenhagen, 2020b; Returpen, 2020).

FORCE Partnership

The FORCE Partnership is part of the FORCE project (FOR Circular Economy), a cooperation initiative funded by the European Commission Horizon 2020, that aims to minimize the outflow of materials from a linear economy and spurs the transition towards a circular economy. The initiative was implemented in four different cities (Copenhagen, Hamburg, Lisbon and Genoa) from September 2016 until February 2021 (European Commission, 2020). With the aim to reach eco-innovative solutions across the four flagship cities, the project followed five main goals:

1. in order to create eco-innovative solutions, it requires engagement of cities, citizens, enterprises as well as academia in 16 participatory value chain-based partnerships
2. by demonstrating new applications for plastic waste, bio waste, wood waste and metals, ten viable end-markets should be developed
3. on the basis of value chain-based partnerships, governance models for the cities need to be developed
4. assessing the actual impact using Big Data and development of decision support tools
5. using the FORCE Academy for replication (European Commission, 2020)

To reach the objectives of the FORCE project within Copenhagen, the municipality established a partnership that included both public and private actors across the plastic material value chain (Alimi et al. 2019). The main actors in the partnership were the City of Copenhagen, Dansk Rotations Plastik, Letbæk Plast, Aage Vestergaard Larsen (AVL), and Dansk Teknologisk Institut (DTI). Together, the partners intended to show that the collection and processing of flexible plastic waste from households and retail or other businesses can result in marketable resources. Therefore, the partners tested and demonstrated around ten innovative application possibilities of flexible plastic waste (FORCE Consortium, n.d.).The partners of the FORCE project in Copenhagen had different roles and responsibilities. Aage Vestergaard Larsen (AVL) was in charge of cleaning and processing of the plastic waste material into secondary raw material. The manufacturing companies, Letbæk Plast and Dansk Rotations Plastik, produced new items, combining secondary raw material and virgin material. The Dansk Teknologisk Institut (DTI) provided the partnership with expert knowledge and process planning (Alimi et al. 2019, Circular Copenhagen, n.d).

Interview Guide

We developed one general interview guide for the two different types of semi-structured interviews, the partner and expert interviews. The basic structure of questions in the interview guide was adjusted accordingly to the specific interview types and contexts of our interview partners. For each interviewee, we further adjusted the basic structure of the interview guide based on information gathered in previous interviews and inputs from the literature that we had been studying simultaneously. With regard to the nature of semi-structure interviews, it is noted that the below presented structure of questions should be understood as a catalog of possible questions, not as a checklist.

Prior to the interview

- Introduction of the interviewers and the objectives of the research project
- Requesting the permission for recording and informing interviewee about the confidentiality of the interview transcripts

Questions regarding the interviewee's role and their organization

- Which position do you hold in your organization?
- What is the core business of your organization?

Concepts

- Innovation
    - How would you define innovation in your company?
    - Which form of innovation do you aim for in your business?
    - Which innovative output did/do you aim for in your partnership?
    - How do you measure innovation?
    - How do you imagine an ideal collaboration leading to innovation?
- Circular economy
    - What does circularity/circular economy mean to you?
    - What do you think is the potential of circular economy?
    - Is it important for your company?
    - Do you have a strategy for circular economy in your business?
- PPPs
    - Do you often participate in PPPs?
    - What do you see as the benefits of PPPs?
    - What do you see as the negative aspects of PPPs?

- What is your personal opinion about the claim that PPPs are needed to solve urban challenges?
- What are your reasons for joining PPPs? (e.g., enhanced reputation/image, competitive advantage, fulfilling company's CSR policy etc.)
- Is the focus on circular economy one of the reasons why you joined the partnership?
- How do you perceive the PPP concept development in Denmark? (specifically with the Municipality of Copenhagen)

General questions

- Match-Making
  - How did you choose the right partners?
  - Did you include SMEs and startups? If not, why?
  - How could SMEs and startups be more included?
  - Are you taking advantage of being part of different networks?
- Type of PPP
  - What were the set objectives in contractual agreements of the partnership?
  - What was the tendering process like (initial tender for partners and subsequent tender for the solution)?
  - What type of procurement process was enacted (pre-commercial procurement or procurement of innovative solutions)?
- Process
  - Can you briefly describe the process of your collaboration in the project/partnership?
  - What were the different stages of the process?
  - Responsibilities
    - Who was in charge/managing the process?
    - How did you divide responsibilities?
    - Did the division of responsibilities visibly impact the power relations within the partnership?
  - Communication
    - How and how often did you communicate?
    - How did you share information and knowledge?
    - How often and where did you meet?
    - Who would facilitate your communication/meetings?
    - Were all partners equally involved in all the communication/meetings?
    - Did you have smaller working groups with only some of the partners?

    - Personal opinion
        - What were the most beneficial aspects of the collaborative process for you?
        - Did the specific partnership fulfil your idea of collaboration and innovation facilitation?
        - What would you improve about the collaboration?
- General challenges with PPP & Innovation
    - What are the biggest challenges in PPPs/pre-commercial procurement in terms of innovation facilitation?
- General barriers with PPP & Innovation
    - Are you aware of any barriers to innovation in the project/partnership?
    - Are you consciously working towards eliminating those barriers to innovation?
- General enablers with PPP & Innovation
    - What do you see as the enablers for innovation in the project/partnership?
    - Are you consciously trying to enable and enhance innovation in any specific way?

Specific challenges and enablers for and barriers to innovation

- Shared goals/visions
    - What are your goals in this partnership as a public/private actor?
    - Do you think these goals differ from the other (public/private) actor?
    - Do you get a sense of shared vision in the partnership?
    - Do you perceive a general conflict of interest between profit-driven and social/society-driven goals between the actors?
    - Does the statement of objectives in the contract/the Waste management plan objectives restrict the innovative outcomes of the partnership?
- Risks
    - How are the risks divided between the public and private party?
    - What are the benefits/problems with this risk allocation?
- Trust/transparency
    - What does *trust* in a PPP mean for you?
    - In which situations do you see the aspect of trust in danger? How can trust be enhanced?
- Roles
    - Leadership (organizational level)
        - Does it make a difference if the public or the private actor takes the lead?
        - Which leadership-skill should the leading actor have?

        - What distinguishes a leader from an initiator?
    - Managerial/leadership skills (individual level)
        - Who is managing the partnership?
        - What skills do they possess? What are they missing?
    - Interpersonal skills (individual level)
        - What kind of interpersonal skills are needed for a successful collaboration/innovation facilitation?
- Resources
    - What kind of resources do the different partners bring into the partnership?
    - Financial
        - What is the financial contribution of the partners (financial capital, man-hours etc.)?
        - If part of an EU-partnership: How does the EU funding impact the innovation development process?
    - Physical and technological capital
    - Human and social capital
    - Intellectual capital
        - What kind of knowledge do the individual partners have?
        - With what kind of knowledge do you contribute to the partnership?
        - How do you make sure that you utilize all the available knowledge?
        - How do you identify knowledge deficiencies? How do you cover for the deficiencies?
- Multidisciplinarity
    - Does multidisciplinarity slow down the process?
    - Does the overall complexity and the *cost of communication* increase with more various actors in the partnership?
    - Does multidisciplinarity bring in more various perspectives into the partnership?
    - What are the benefits of partnering with different types of organizations (commercial, nongovernmental, governmental etc.)? What do they contribute to the collaboration?
- Design thinking
    - Are you familiar with the principles of design thinking?
    - Are you familiar with different methods and tools of design thinking?
    - Are you applying the principles and methods of design thinking in the partnership?
- Co-creation
    - Which role does co-creation have for you/in your organization?

    - Did you involve users/citizens in the partnership?
    - When does it (not) make sense to involve them?
    - What do you perceive as the benefits/drawbacks of co-creation?
- Inspiration for innovation
    - Where do you get your inspiration for innovation from?
    - Do you look up to different cities/countries/industries?
- Timeframe
    - What is the usual timeframe for innovative partnerships?
    - Does the *deadline* aspect limit the innovation?
    - Do the partners have different time frames? How do they differ?
- Innovation implementation
    - How is the innovation diffused within the industry?
- Covid-19 pandemic
    - How did the current Covid-19 pandemic impact the partnership?

Thematic Networks Analysis

In our data analysis, we implemented the six steps of the thematic networks approach described by Attride-Stirling (2001). The following section presents our coding framework and provides visualizations of our analytical process (identifying recurring themes and constructing thematic networks) that were created in the online visual collaboration platform Miro.

Coding Framework

The presented coding framework below (see Table 1) is based on both theoretical concepts which are consolidated in our analytical framework, and on the gathered data itself.

The coding framework consist of five main umbrella codes (written in bold) that stem from the integrated framework for collaborative governance by Emerson et al. (2012). Some of the lower category codes (marked in blue) originate from the conceptual and theoretical framework, especially from the framework by Emerson et al. (2012) and the Double Diamond framework for innovation by the Design Council (2015). However, as demonstrated in the description of each code, we have adjusted those to fit our research. Furthermore, we established other codes (marked in green) that emerged from the actual interview data.

Table 1: Coding Framework. Own creation.

Code name	Code description
Collaborative Action	Specific actions taken in the process after the partnerships have been established
Co-Creation with citizens	Experience with co-creation, reasons for implementing co-creation, benefits and drawbacks of co-creation, role of the users/citizens
Experimentation	Prototyping, testing, pilot projects
External Communication	Marketing
Innovation Process	Idea generation, idea selection, idea implementation, idea dissemination
Iterative vs. Linear	Perception of the innovation process as iterative or linear. Characteristics of an iterative/linear process.
Collaborative Dynamics	Factors that set the tone and framework for the specific partnerships
Capacity for joint action	Factors related to the specific process setup

Challenges	Technological, practical, user-related, political etc.
Communication & knowledge sharing	How was knowledge and information shared among partners, how often, between whom etc.
Communication towards own organization	Communication about the collaboration in the individual organizations
Meetings & Workshops	Meetings scheduled, content of the workshops etc.
Working groups	Working group setup, working all together vs. establishing smaller working groups
Conflicts & Misunderstandings	Between partners in the process
Contract & Manifest	Necessity for a legal agreement, content of the contract etc.
Leadership & Project management	Factors related to the initiator/facilitator of the collaboration
External Facilitator	Presence or a need for external facilitator, opinion about external facilitators
General Skills	What kind of managerial/leadership/interpersonal skills should a facilitator of such collaboration have?
In the Partnerships	What were the characteristics and actions of the facilitator in the collaboration? What was done right/wrong?
Multidisciplinarity	Benefits, drawbacks, importance, of multidisciplinarity; Including SMEs & startups, universities & researchers
People around the table	Role of the interviewees in their organizations, Interviewee's attitude (own initiatives, openness, curiosity etc.)
Resources	What kind of resources did the partner bring in (human, technological, financial, time etc.)
Risks	Risk allocation among partners
Timeframe	Impact of having a timeframe in the partnership, time frame alignment, differences between public and private timeframes
Principled Engagement	Processes and factors in establishing the specific partnerships
Match-making	Call for partners, who approached whom, official or personal networks, how to choose partners
Objectives	Vision, objectives, agenda – defining them, aligning them; what are the different objectives of the different partners?
Reasons to collaborate	Reasons for establishing and joining the partnership

Roles & Responsibilities	Role of the organization in the partnership, public sector's role, private sector's role, role of the initiator
Shared Motivation	Factors regarding personal relationships and previous experience
Mutual trust	How is trust built among the partners?
Mutual understanding	Previous experiences with working together, understanding the other partners, understanding how they work and why
Power relations	Hierarchy, feeling of inclusivity etc.
Collaborative Outcomes	Results of the collaborative process
Benefits	Knowledge generation, different types of learnings, etc.
Drawbacks & Improvements	Personal opinion about the collaboration, "What would you have done differently?"
Future steps	Upscaling, adjusting the regulatory framework etc.
Innovative Outcomes	The different types of perceived innovative outcomes (Technical, Organizational, Supply chain innovation etc.)
Drivers	General "favorable" conditions that allow for public-private collaboration and innovation
Collaboration with Private Sector	Benefits, drawbacks, frequency, previous experiences
Collaboration with Public Sector	Benefits, drawbacks, frequency, previous experiences
Interdependence	Knowing that multidisciplinary collaboration is necessary, „Can't do it on our own"
Societal & Environmental Challenges	Climate change, large amount of waste, „wicked problems" etc.
Trends	Trends providing space or incentive for exploring the topic
Circular Economy	
Increased citizen expectations	Tailor-made solutions, their interest in sustainability, high quality solutions
Other	Digitalization, technology, globalization etc.
Sustainability	
System Context	General legal, political, and socioeconomic influences and opportunities
Covid-19	Mostly challenges connected to the pandemic and related restrictions

EU	Connection to EU objectives, frameworks, or funding
Legal & Regulatory Framework	The rules concerning public-private collaborations, tenders, innovation, waste management etc.
Politics	E.g., influence of different political representatives on the municipal agenda

Identifying Recurring Themes

In the second step of Attride-Stirling's (2001) thematic networks analysis approach, we identified themes from the coded text segments that were recurring in the partner interviews and clustered them under the structure of the coding framework (see Figure 1).

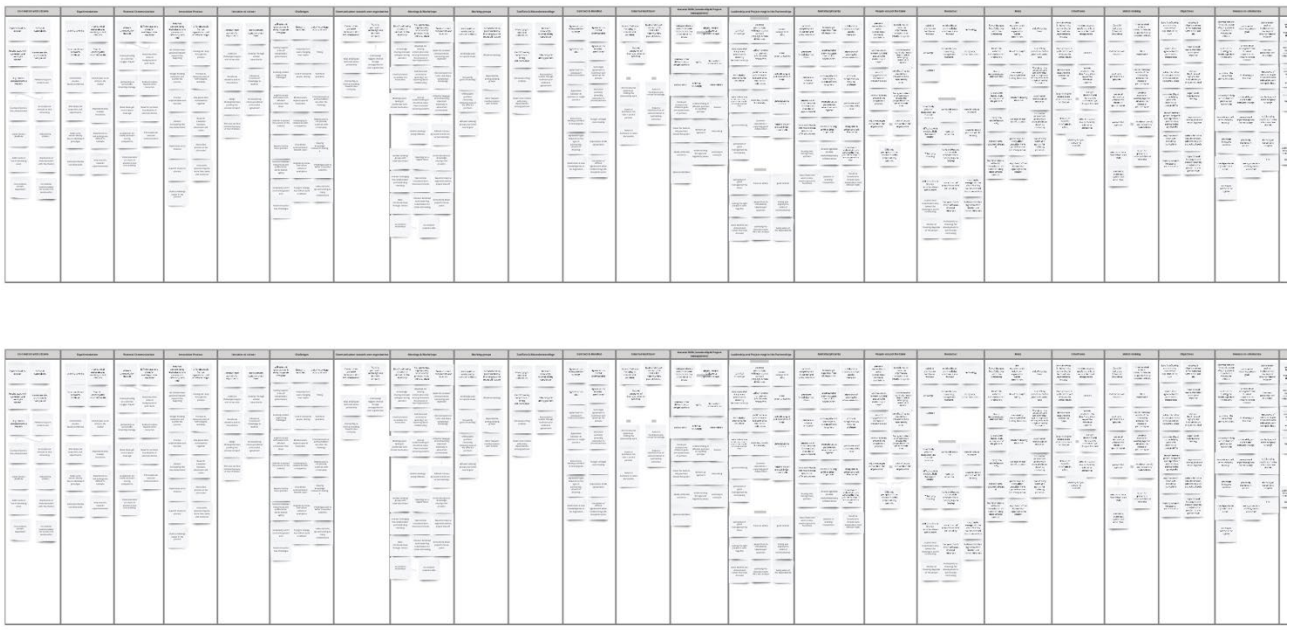
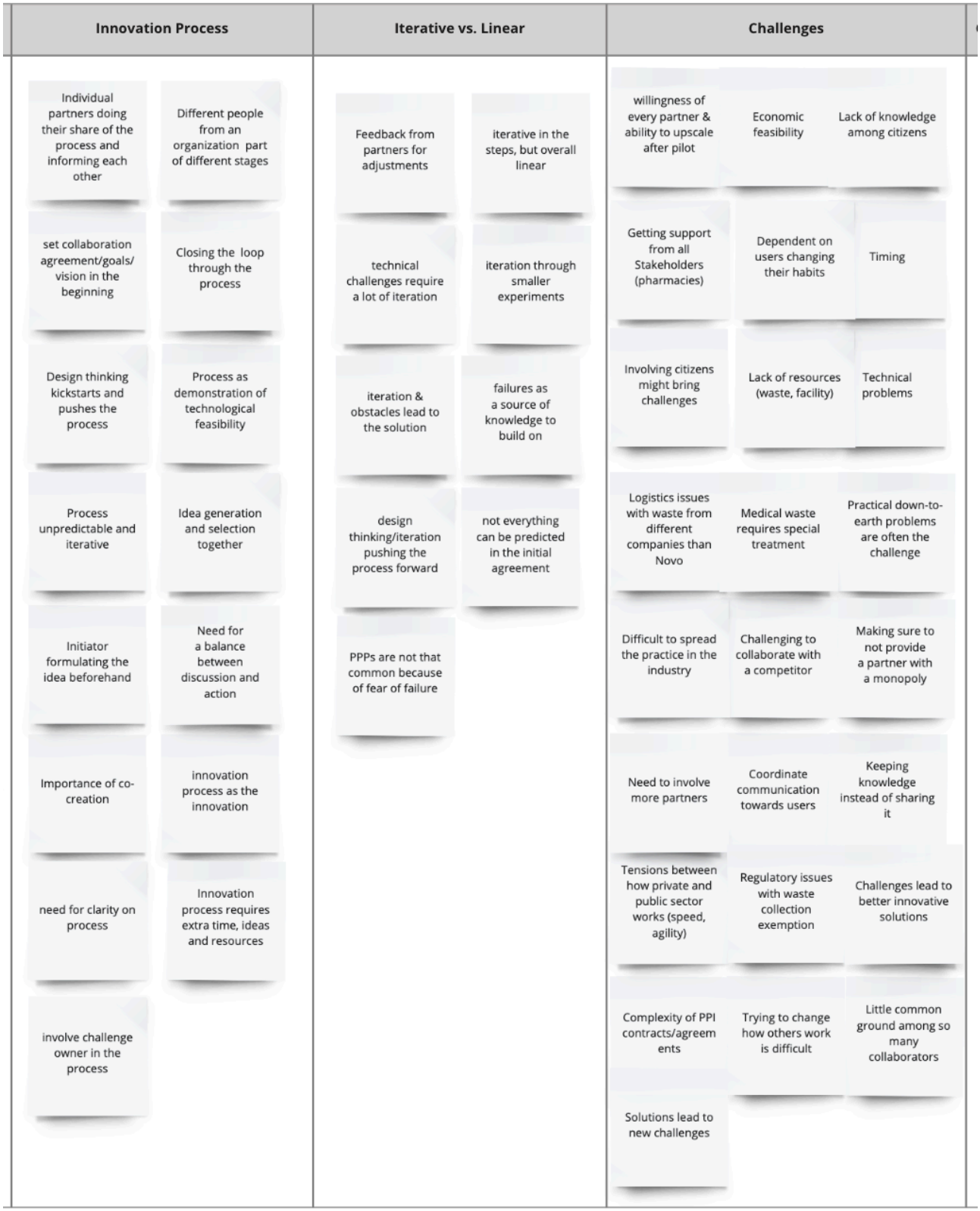
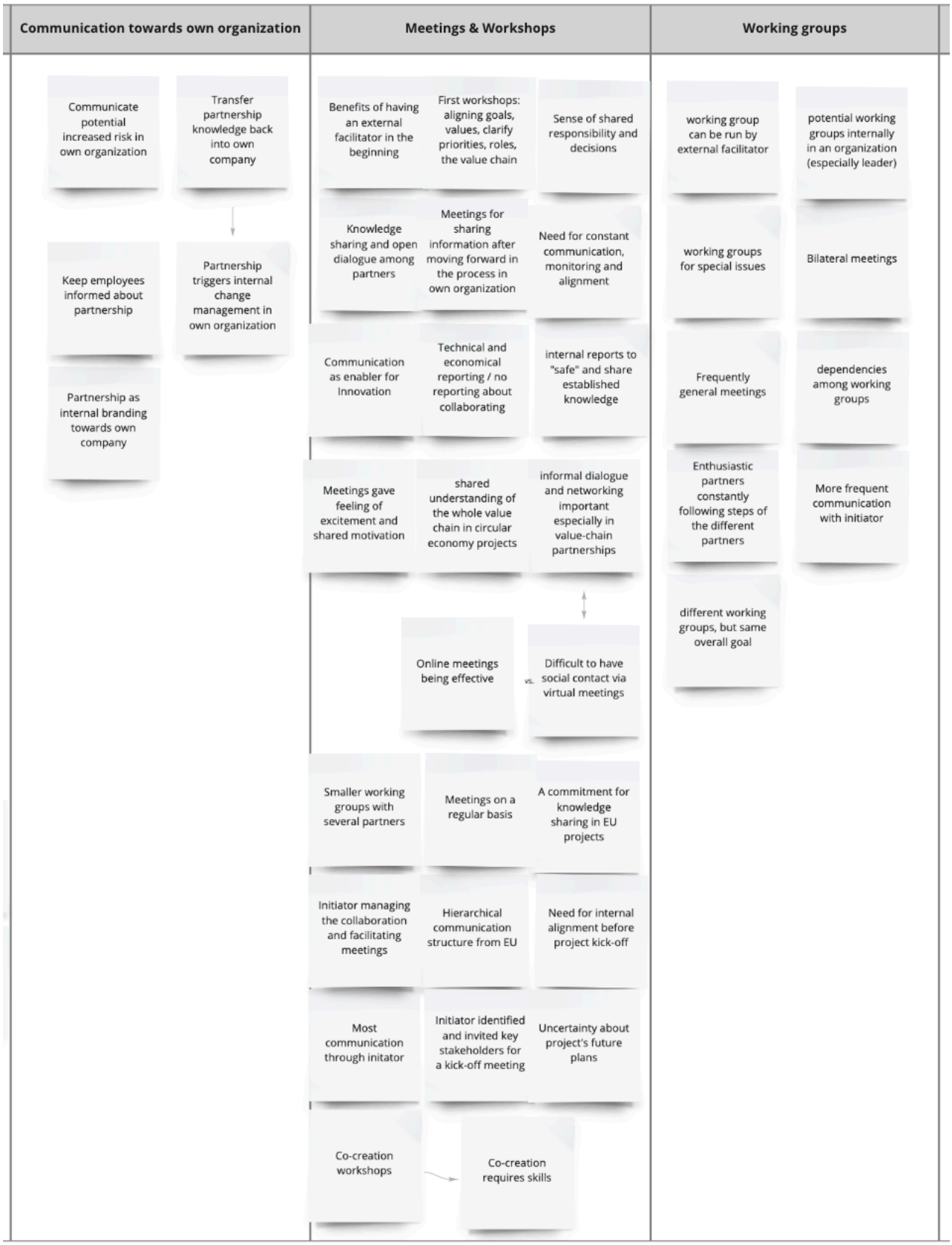


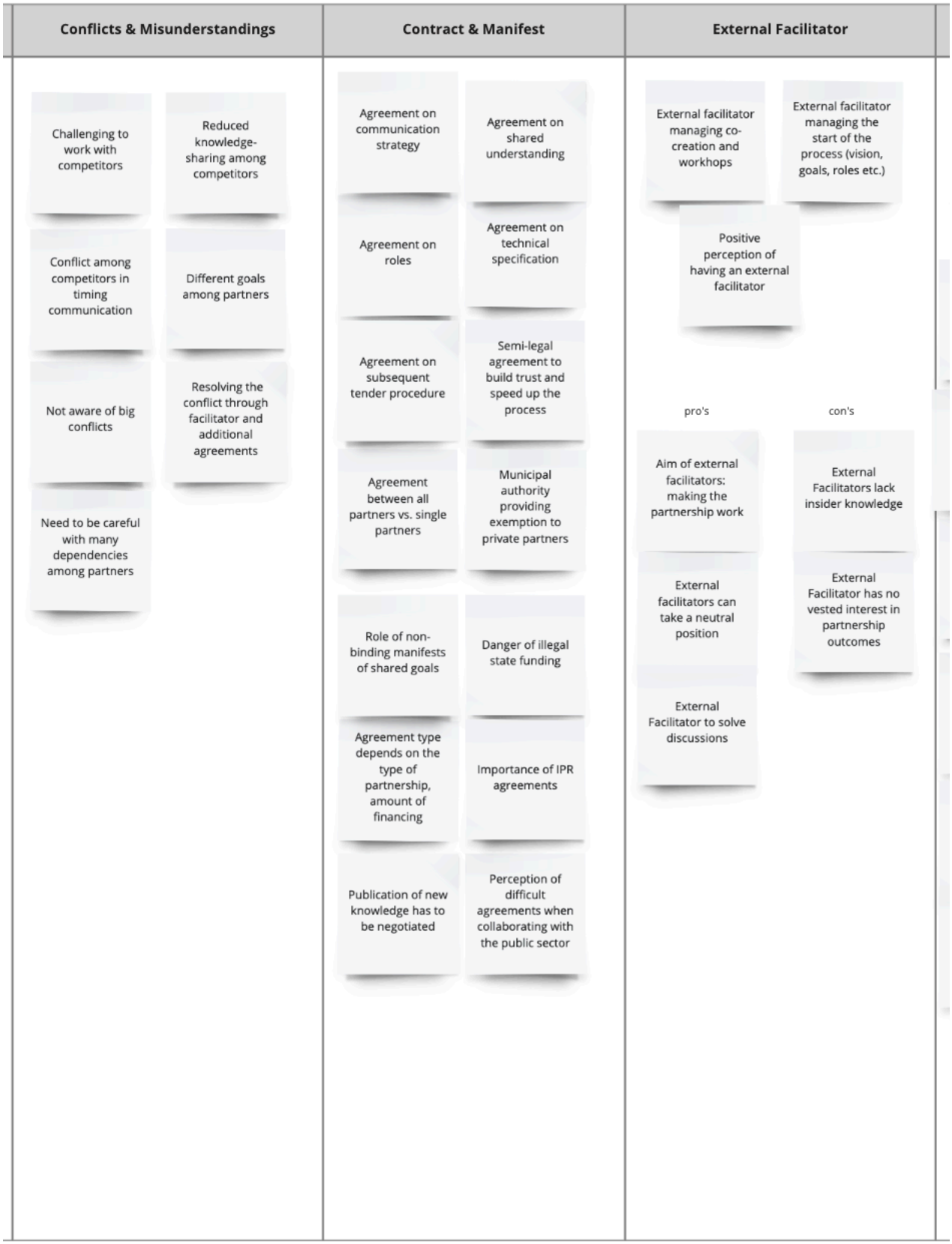
Figure 1: Identification of Themes. Own illustration[3].

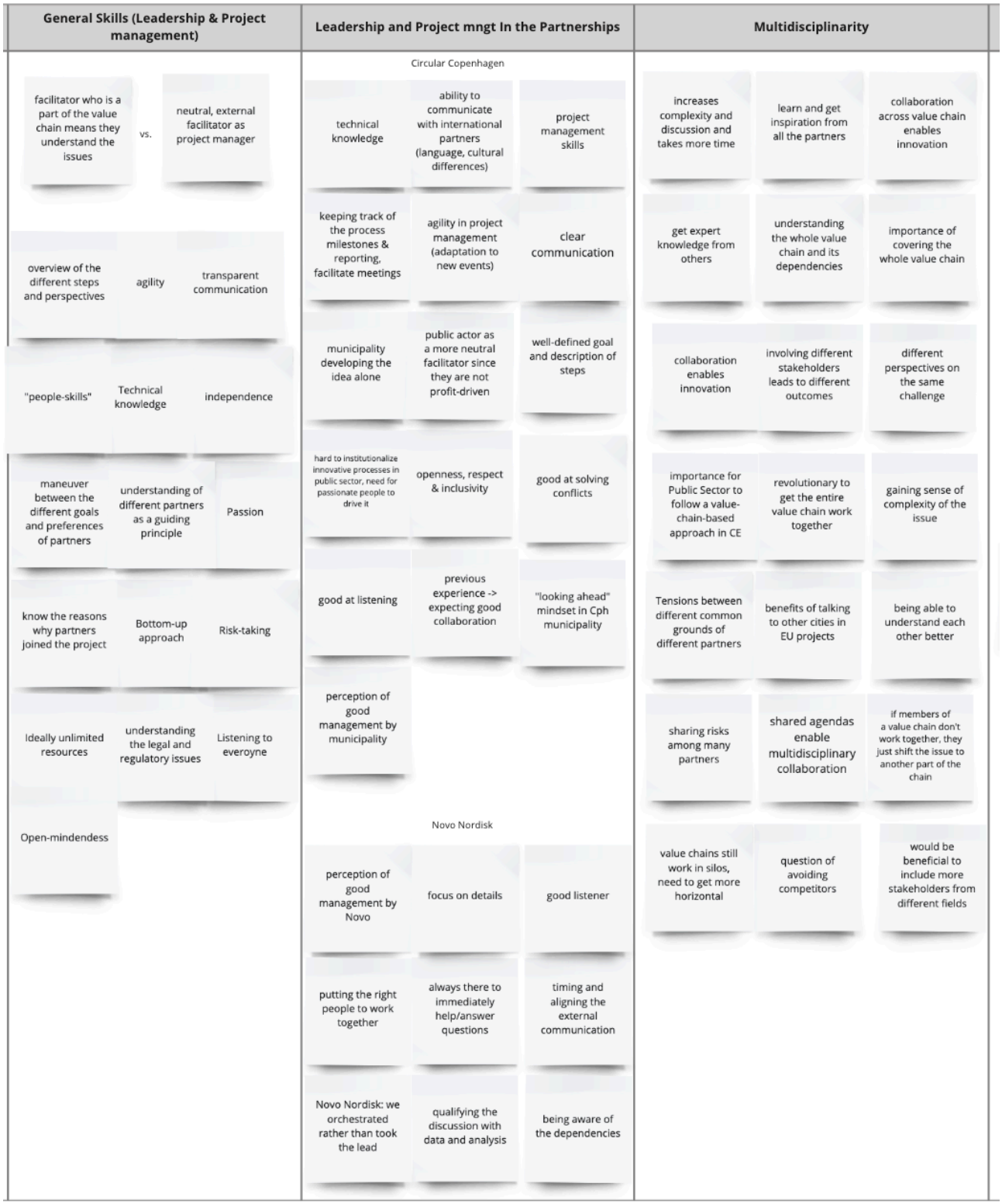
[3] The single columns of the table are depicted in more detail on the following pages.

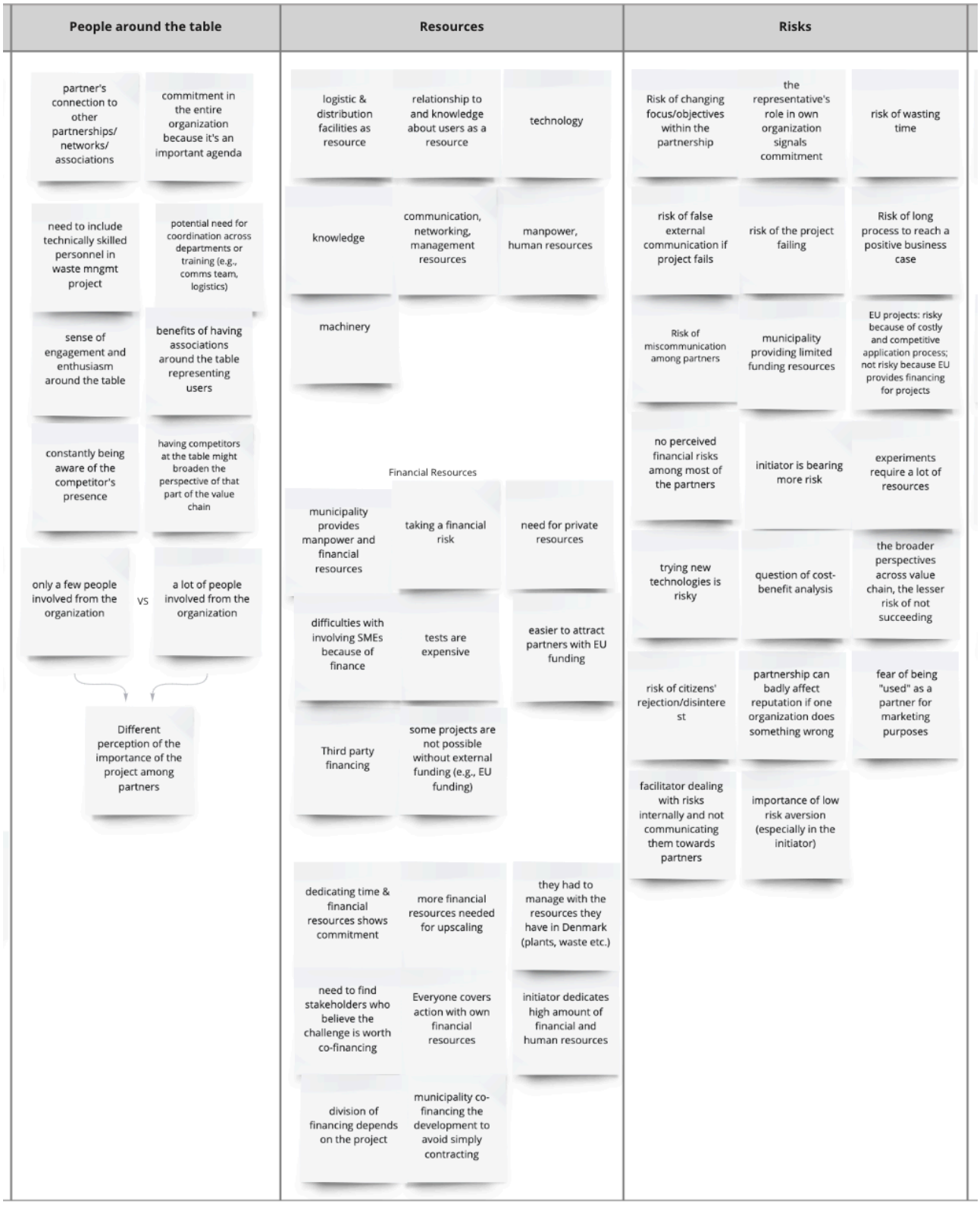

Co-Creation with citizens
Importance of co-creation
Involve all stakeholders
Provide users with convenient and meaningful solution
Understand the user's need & background
High citizen expectations/citiz en push
Different ways to involve users
Involve citizens in the entire process
Co-creation is complex & time consuming
Value citizen's feedback
Educate the citizens
Public sector's role in educating users
Importance of communication with the citizens
Co-creation is project dependant
Co-creation (unfortunately) not common in waste sector
Experimentation
Learning by doing
Importance of demonstrating feasibility on test solutions
Experimentation is resource-intensive
Need for upscaling after experimentation
Incremental success builds confidence
Pilot project as an entry to the market
Pilot allows for inspiration and adjustments
Experimentation enables Innovation
Public actor cannot directly buy co-developed prototype
Experiments in real settings are difficult to facilitate
Personal initiative can drive tests
Risk-aversion towards experimentation
External Communication
Different communication channels
Different partners allows for reaching a wider population
Communicating as a unit has a bigger impact
Understand the cultural background of your users
partnership as sustainable branding strategy
External comms requires extra resources
Novel ideas get a lot of press coverage
Need for constant coordination in external comms
competition for media attention among competitors
IPR complicate external communication
Communication as a form of education and trust-building

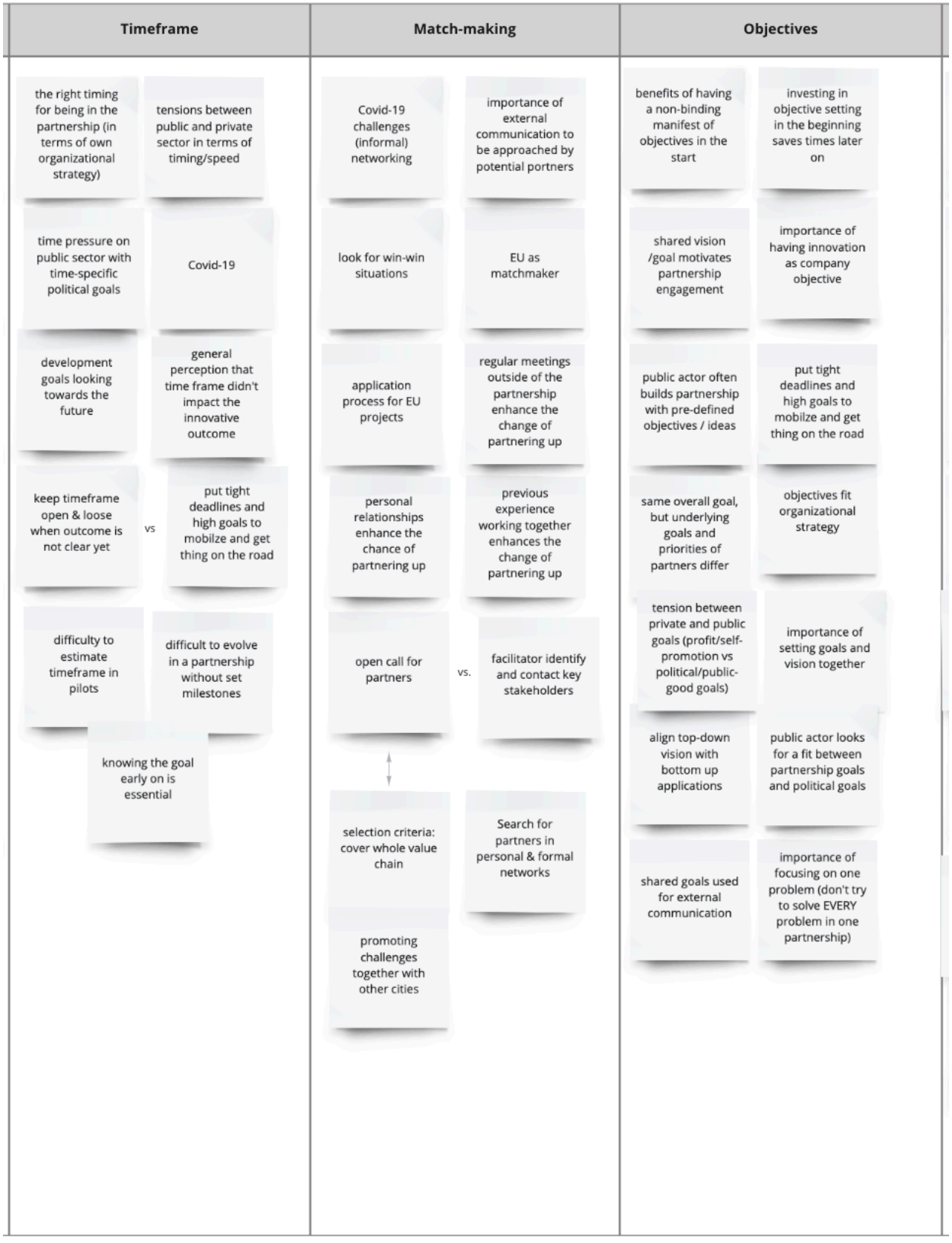

Innovation Process
Individual partners doing their share of the process and informing each other
Different people from an organization part of different stages
set collaboration agreement/goals/ vision in the beginning
Closing the loop through the process
Design thinking kickstarts and pushes the process
Process as demonstration of technological feasibility
Process unpredictable and iterative
Idea generation and selection together
Initiator formulating the idea beforehand
Need for a balance between discussion and action
Importance of co-creation
innovation process as the innovation
need for clarity on process
Innovation process requires extra time, ideas and resources
involve challenge owner in the process
Iterative vs. Linear
Feedback from partners for adjustments
iterative in the steps, but overall linear
technical challenges require a lot of iteration
iteration through smaller experiments
iteration & obstacles lead to the solution
failures as a source of knowledge to build on
design thinking/iteration pushing the process forward
not everything can be predicted in the initial agreement
PPPs are not that common because of fear of failure
Challenges
willingness of every partner & ability to upscale after pilot
Economic feasibility
Lack of knowledge among citizens
Getting support from all Stakeholders (pharmacies)
Dependent on users changing their habits
Timing
Involving citizens might bring challenges
Lack of resources (waste, facility)
Technical problems
Logistics issues with waste from different companies than Novo
Medical waste requires special treatment
Practical down-to-earth problems are often the challenge
Difficult to spread the practice in the industry
Challenging to collaborate with a competitor
Making sure to not provide a partner with a monopoly
Need to involve more partners
Coordinate communication towards users
Keeping knowledge instead of sharing it
Tensions between how private and public sector works (speed, agility)
Regulatory issues with waste collection exemption
Challenges lead to better innovative solutions
Complexity of PPI contracts/agreements
Trying to change how others work is difficult
Little common ground among so many collaborators
Solutions lead to new challenges

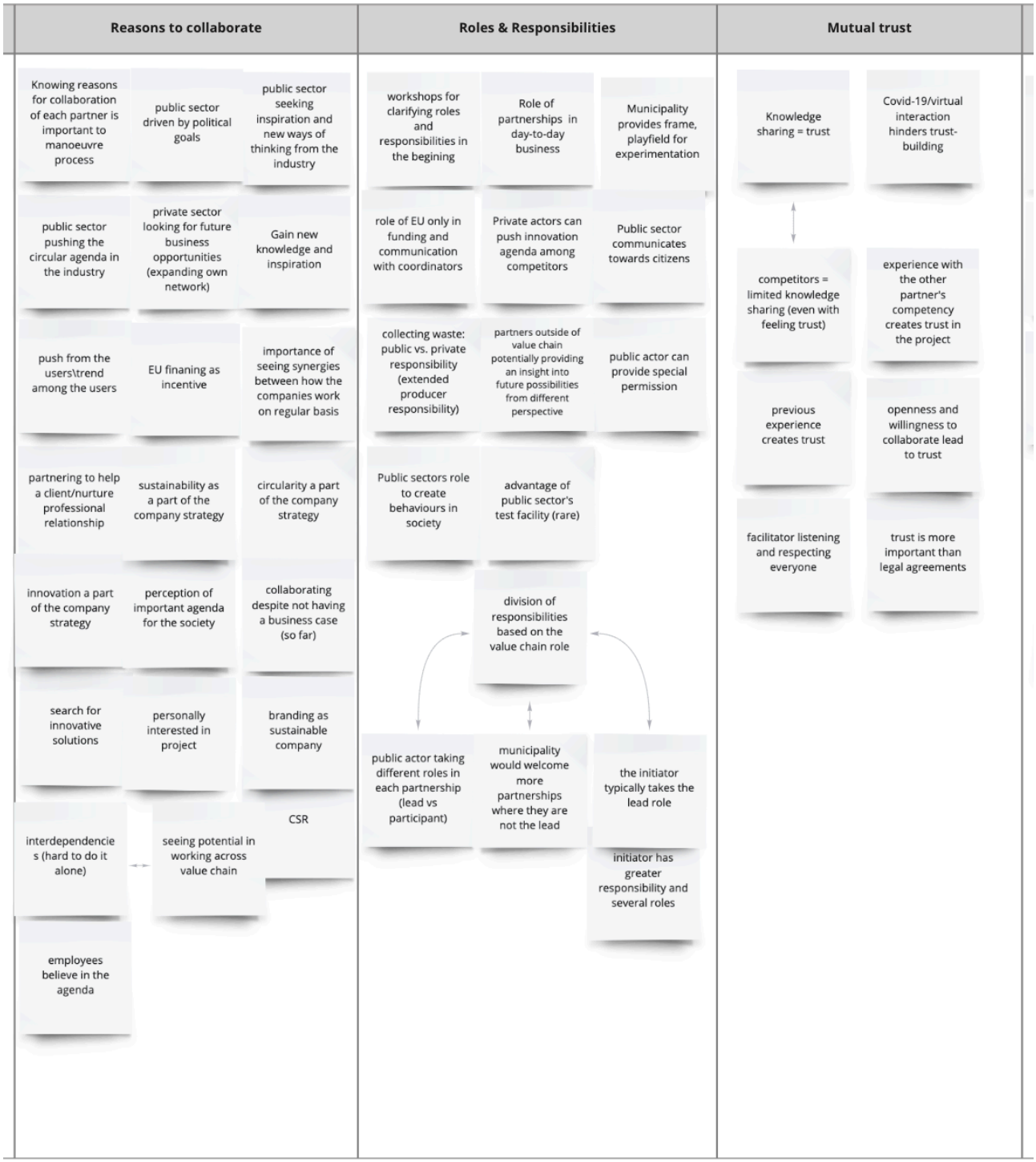

Communication towards own organization
Meetings & Workshops
Working groups
Communicate potential increased risk in own organization
Transfer partnership knowledge back into own company
Keep employees informed about partnership
Partnership triggers internal change management in own organization
Partnership as internal branding towards own company
Benefits of having an external facilitator in the beginning
First workshops: aligning goals, values, clarify priorities, roles, the value chain
Sense of shared responsibility and decisions
Knowledge sharing and open dialogue among partners
Meetings for sharing information after moving forward in the process in own organization
Need for constant communication, monitoring and alignment
Communication as enabler for Innovation
Technical and economical reporting / no reporting about collaborating
internal reports to "safe" and share established knowledge
Meetings gave feeling of excitement and shared motivation
shared understanding of the whole value chain in circular economy projects
informal dialogue and networking important especially in value-chain partnerships
Online meetings being effective
vs.
Difficult to have social contact via virtual meetings
Smaller working groups with several partners
Meetings on a regular basis
A commitment for knowledge sharing in EU projects
Initiator managing the collaboration and facilitating meetings
Hierarchical communication structure from EU
Need for internal alignment before project kick-off
Most communication through initator
Initiator identified and invited key stakeholders for a kick-off meeting
Uncertainty about project's future plans
Co-creation workshops
Co-creation requires skills
working group can be run by external facilitator
potential working groups internally in an organization (especially leader)
working groups for special issues
Bilateral meetings
Frequently general meetings
dependencies among working groups
Enthusiastic partners constantly following steps of the different partners
More frequent communication with initiator
different working groups, but same overall goal

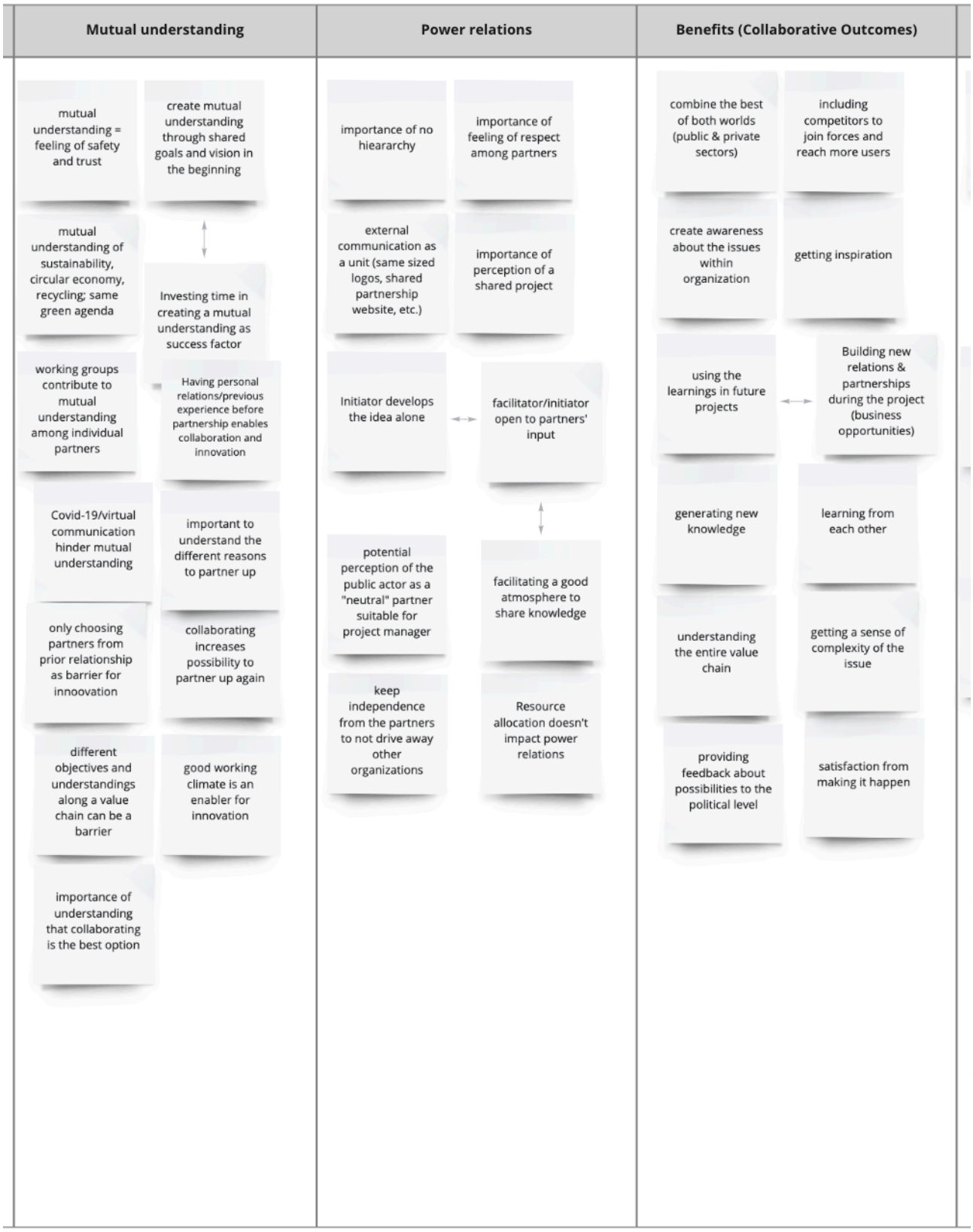

Conflicts & Misunderstandings
Challenging to work with competitors
Reduced knowledge-sharing among competitors
Conflict among competitors in timing communication
Different goals among partners
Not aware of big conflicts
Resolving the conflict through facilitator and additional agreements
Need to be careful with many dependencies among partners
Contract & Manifest
Agreement on communication strategy
Agreement on shared understanding
Agreement on roles
Agreement on technical specification
Agreement on subsequent tender procedure
Semi-legal agreement to build trust and speed up the process
Agreement between all partners vs. single partners
Municipal authority providing exemption to private partners
Role of non-binding manifests of shared goals
Danger of illegal state funding
Agreement type depends on the type of partnership, amount of financing
Importance of IPR agreements
Publication of new knowledge has to be negotiated
Perception of difficult agreements when collaborating with the public sector
External Facilitator
External facilitator managing co-creation and workhops
External facilitator managing the start of the process (vision, goals, roles etc.)
Positive perception of having an external facilitator
pro's
con's
Aim of external facilitators: making the partnership work
External Facilitators lack insider knowledge
External facilitators can take a neutral position
External Facilitator has no vested interest in partnership outcomes
External Facilitator to solve discussions

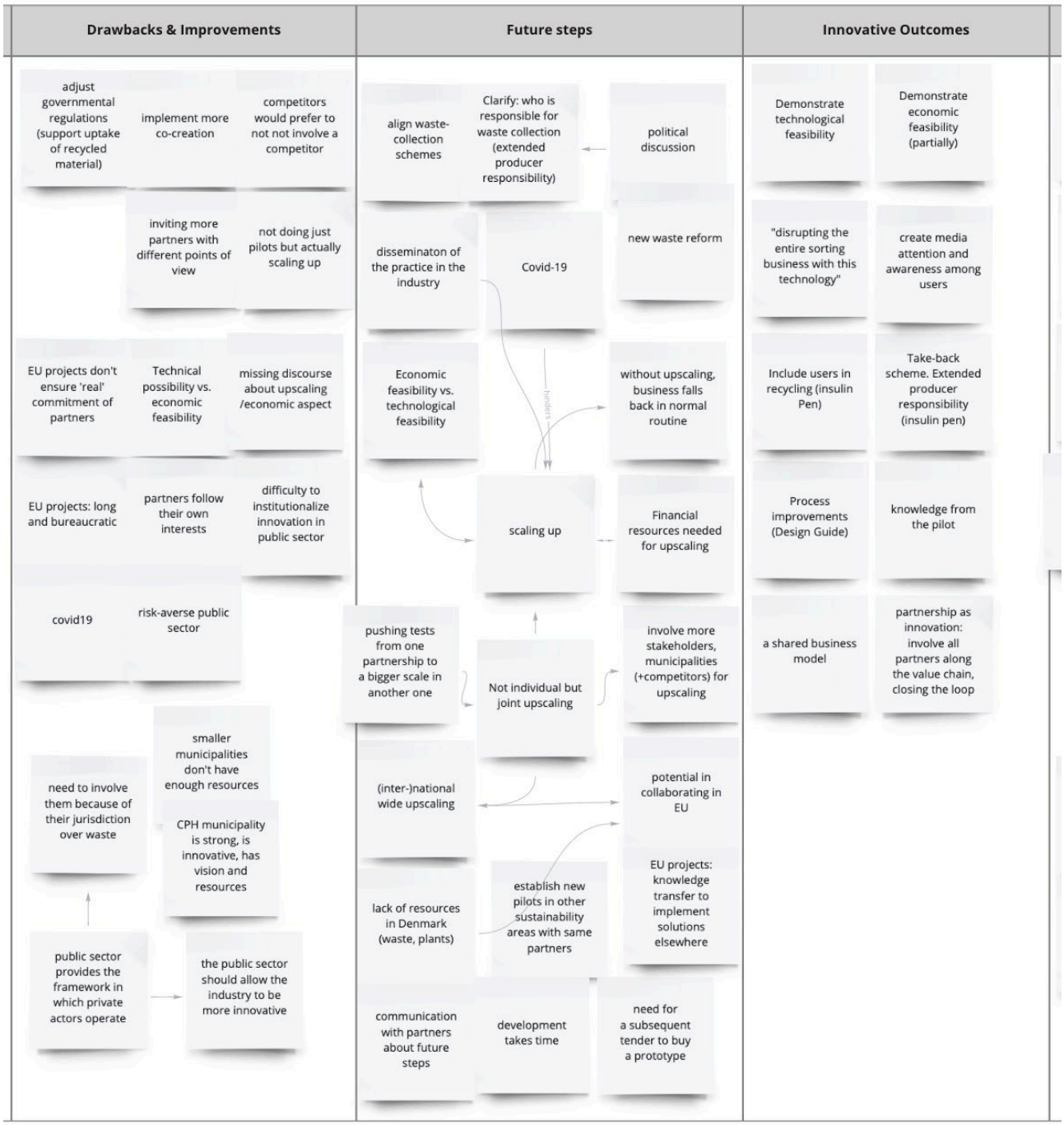

General Skills (Leadership & Project management)
facilitator who is a part of the value chain means they understand the issues
vs.
neutral, external facilitator as project manager
overview of the different steps and perspectives
agility
transparent communication
"people-skills"
Technical knowledge
independence
maneuver between the different goals and preferences of partners
understanding of different partners as a guiding principle
Passion
know the reasons why partners joined the project
Bottom-up approach
Risk-taking
Ideally unlimited resources
understanding the legal and regulatory issues
Listening to everoyne
Open-mindendess
Leadership and Project mngt In the Partnerships
Circular Copenhagen
technical knowledge
ability to communicate with international partners (language, cultural differences)
project management skills
keeping track of the process milestones & reporting, facilitate meetings
agility in project management (adaptation to new events)
clear communication
municipality developing the idea alone
public actor as a more neutral facilitator since they are not profit-driven
well-defined goal and description of steps
hard to institutionalize innovative processes in public sector, need for passionate people to drive it
openness, respect & inclusivity
good at solving conflicts
good at listening
previous experience -> expecting good collaboration
"looking ahead" mindset in Cph municipality
perception of good management by municipality
Novo Nordisk
perception of good management by Novo
focus on details
good listener
putting the right people to work together
always there to immediately help/answer questions
timing and aligning the external communication
Novo Nordisk: we orchestrated rather than took the lead
qualifying the discussion with data and analysis
being aware of the dependencies
Multidisciplinarity
increases complexity and discussion and takes more time
learn and get inspiration from all the partners
collaboration across value chain enables innovation
get expert knowledge from others
understanding the whole value chain and its dependencies
importance of covering the whole value chain
collaboration enables innovation
involving different stakeholders leads to different outcomes
different perspectives on the same challenge
importance for Public Sector to follow a value-chain-based approach in CE
revolutionary to get the entire value chain work together
gaining sense of complexity of the issue
Tensions between different common grounds of different partners
benefits of talking to other cities in EU projects
being able to understand each other better
sharing risks among many partners
shared agendas enable multidisciplinary collaboration
if members of a value chain don't work together, they just shift the issue to another part of the chain
value chains still work in silos, need to get more horizontal
question of avoiding competitors
would be beneficial to include more stakeholders from different fields

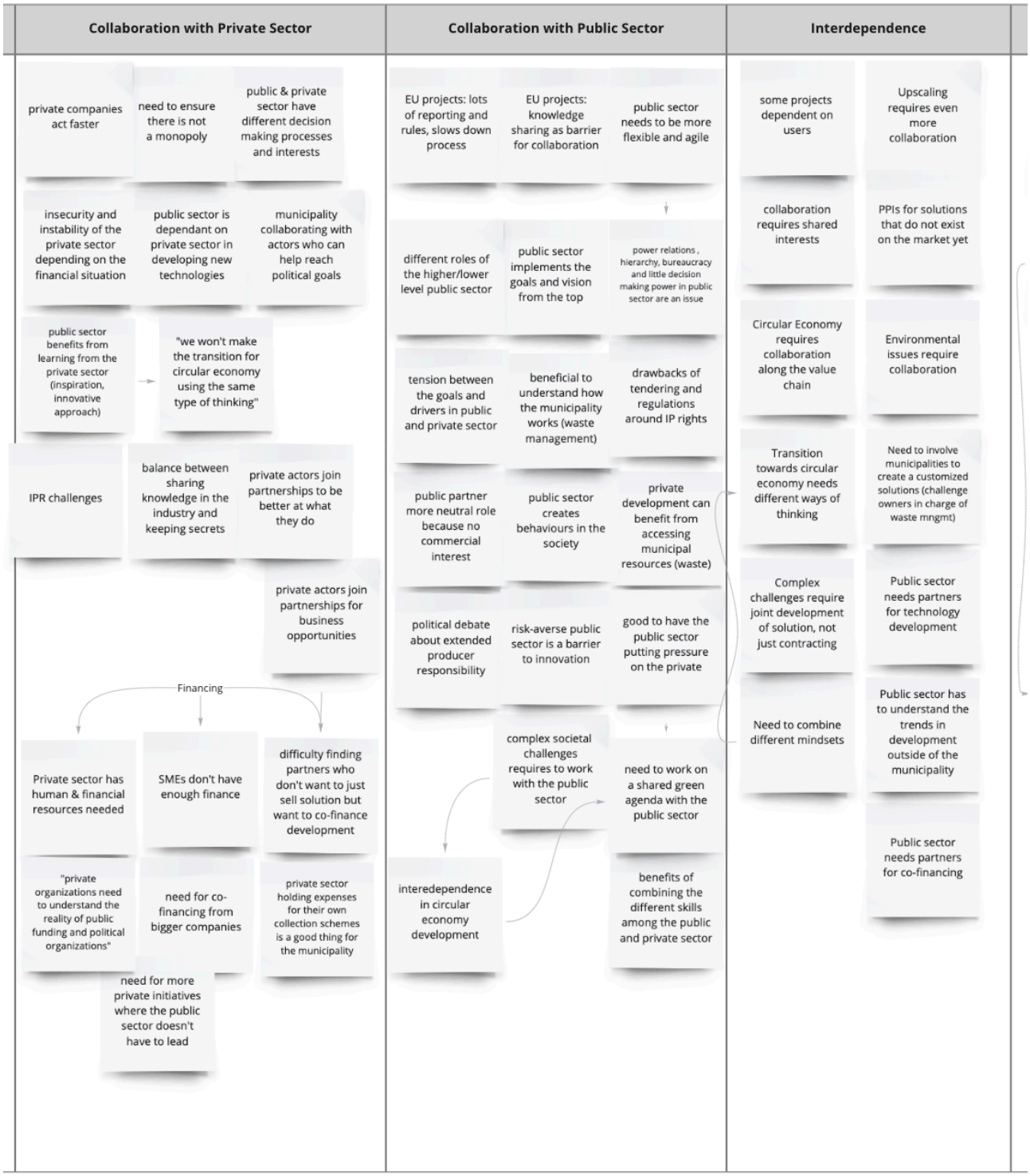

People around the table
partner's connection to other partnerships/ networks/ associations
commitment in the entire organization because it's an important agenda
need to include technically skilled personnel in waste mngmt project
potential need for coordination across departments or training (e.g., comms team, logistics)
sense of engagement and enthusiasm around the table
benefits of having associations around the table representing users
constantly being aware of the competitor's presence
having competitors at the table might broaden the perspective of that part of the value chain
only a few people involved from the organization
VS
a lot of people involved from the organization
Different perception of the importance of the project among partners
Resources
logistic & distribution facilities as resource
relationship to and knowledge about users as a resource
technology
knowledge
communication, networking, management resources
manpower, human resources
machinery
Financial Resources
municipality provides manpower and financial resources
taking a financial risk
need for private resources
difficulties with involving SMEs because of finance
tests are expensive
easier to attract partners with EU funding
Third party financing
some projects are not possible without external funding (e.g., EU funding)
dedicating time & financial resources shows commitment
more financial resources needed for upscaling
they had to manage with the resources they have in Denmark (plants, waste etc.)
need to find stakeholders who believe the challenge is worth co-financing
Everyone covers action with own financial resources
initiator dedicates high amount of financial and human resources
division of financing depends on the project
municipality co-financing the development to avoid simply contracting
Risks
Risk of changing focus/objectives within the partnership
the representative's role in own organization signals commitment
risk of wasting time
risk of false external communication if project fails
risk of the project failing
Risk of long process to reach a positive business case
Risk of miscommunication among partners
municipality providing limited funding resources
EU projects: risky because of costly and competitive application process; not risky because EU provides financing for projects
no perceived financial risks among most of the partners
initiator is bearing more risk
experiments require a lot of resources
trying new technologies is risky
question of cost-benefit analysis
the broader perspectives across value chain, the lesser risk of not succeeding
risk of citizens' rejection/disinterest
partnership can badly affect reputation if one organization does something wrong
fear of being "used" as a partner for marketing purposes
facilitator dealing with risks internally and not communicating them towards partners
importance of low risk aversion (especially in the initiator)

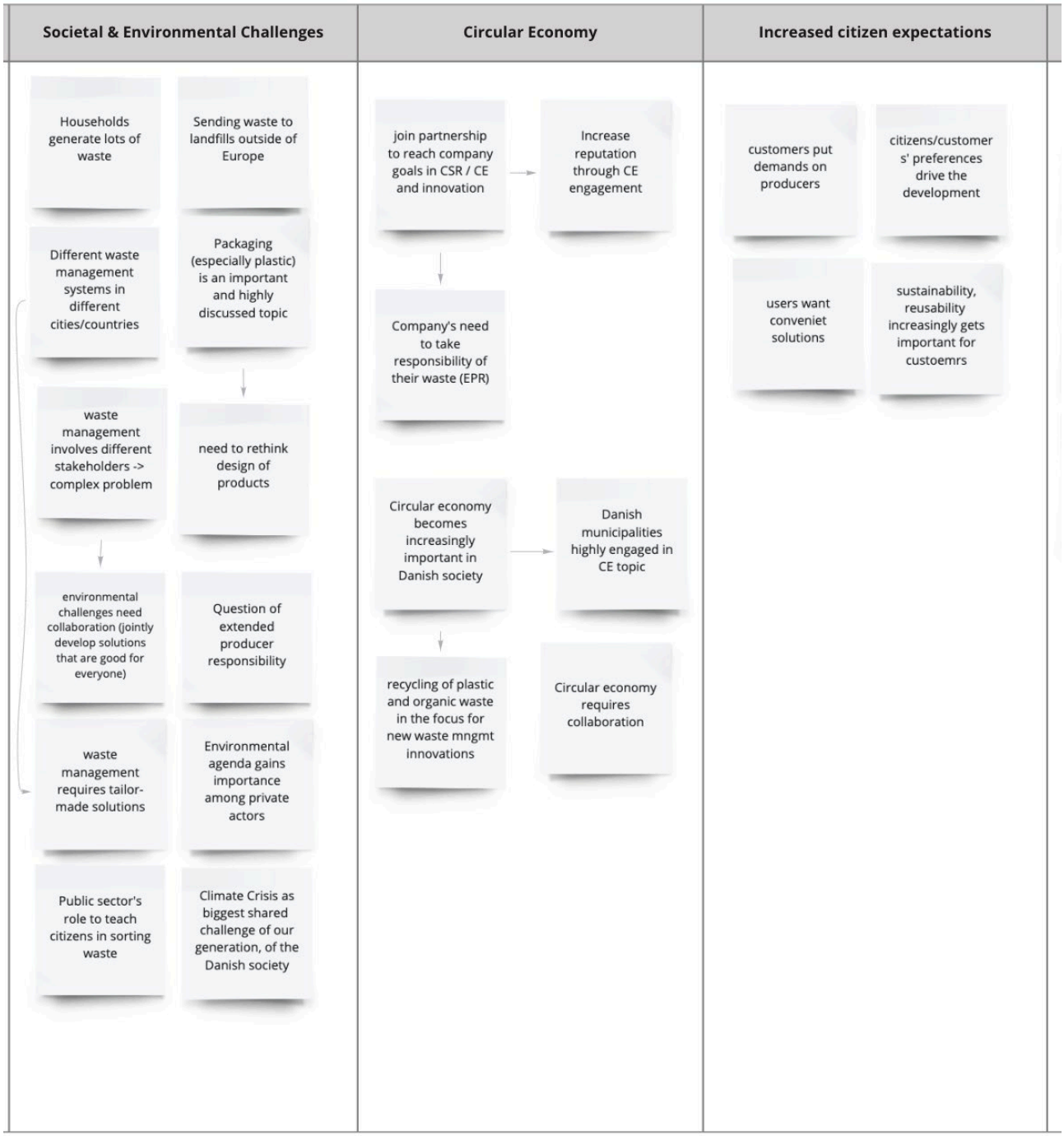

Timeframe
the right timing for being in the partnership (in terms of own organizational strategy)
tensions between public and private sector in terms of timing/speed
time pressure on public sector with time-specific political goals
Covid-19
development goals looking towards the future
general perception that time frame didn't impact the innovative outcome
keep timeframe open & loose when outcome is not clear yet
vs
put tight deadlines and high goals to mobilze and get thing on the road
difficulty to estimate timeframe in pilots
difficult to evolve in a partnership without set milestones
knowing the goal early on is essential
Match-making
Covid-19 challenges (informal) networking
importance of external communication to be approached by potential portners
look for win-win situations
EU as matchmaker
application process for EU projects
regular meetings outside of the partnership enhance the change of partnering up
personal relationships enhance the chance of partnering up
previous experience working together enhances the change of partnering up
open call for partners
vs.
facilitator identify and contact key stakeholders
selection criteria: cover whole value chain
Search for partners in personal & formal networks
promoting challenges together with other cities
Objectives
benefits of having a non-binding manifest of objectives in the start
investing in objective setting in the beginning saves times later on
shared vision /goal motivates partnership engagement
importance of having innovation as company objective
public actor often builds partnership with pre-defined objectives / ideas
put tight deadlines and high goals to mobilze and get thing on the road
same overall goal, but underlying goals and priorities of partners differ
objectives fit organizational strategy
tension between private and public goals (profit/self-promotion vs political/public-good goals)
importance of setting goals and vision together
align top-down vision with bottom up applications
public actor looks for a fit between partnership goals and political goals
shared goals used for external communication
importance of focusing on one problem (don't try to solve EVERY problem in one partnership)

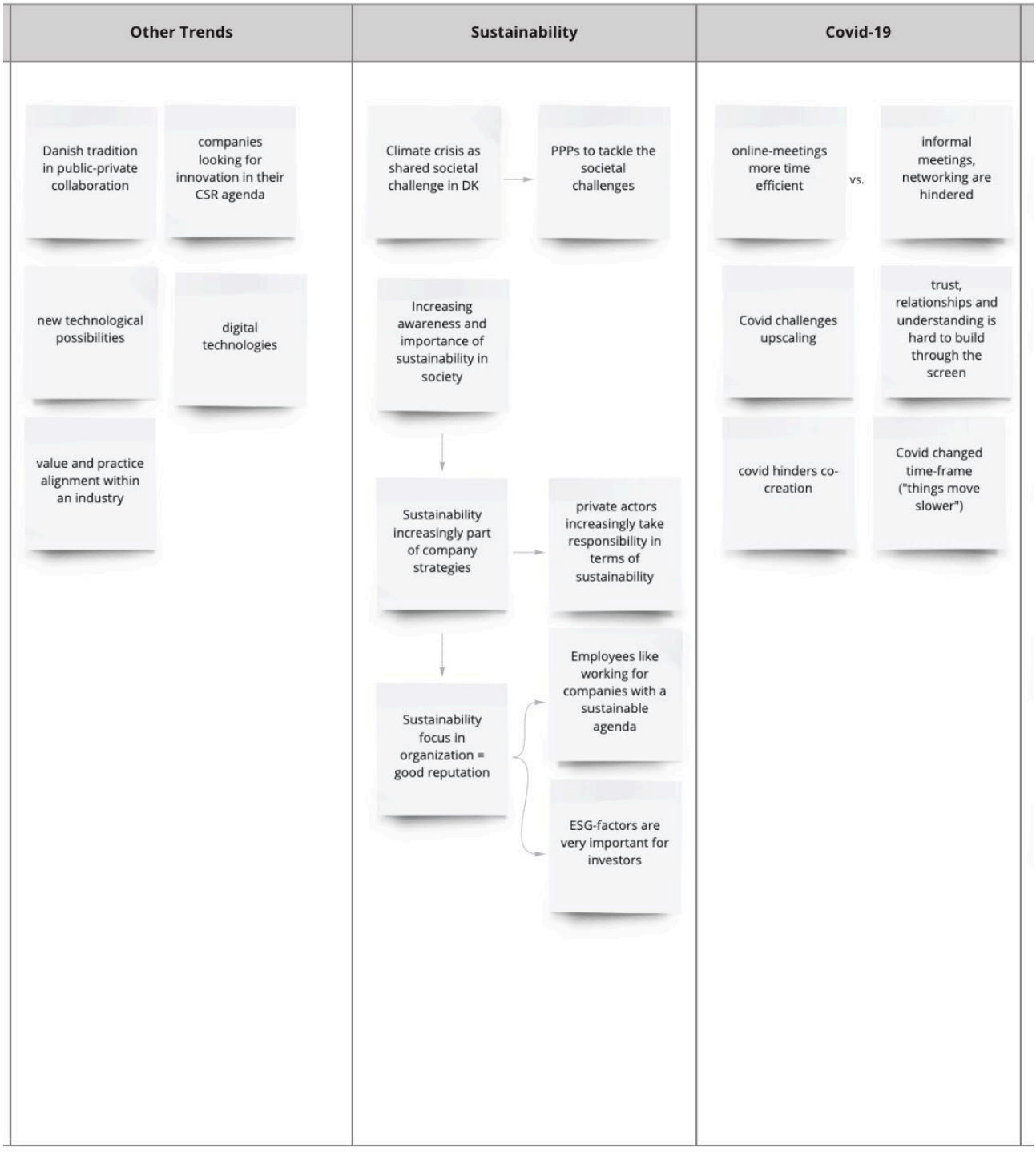

Reasons to collaborate
Knowing reasons for collaboration of each partner is important to manoeuvre process
public sector driven by political goals
public sector seeking inspiration and new ways of thinking from the industry
public sector pushing the circular agenda in the industry
private sector looking for future business opportunities (expanding own network)
Gain new knowledge and inspiration
push from the users\trend among the users
EU finaning as incentive
importance of seeing synergies between how the companies work on regular basis
partnering to help a client/nurture professional relationship
sustainability as a part of the company strategy
circularity a part of the company strategy
innovation a part of the company strategy
perception of important agenda for the society
collaborating despite not having a business case (so far)
search for innovative solutions
personally interested in project
branding as sustainable company
CSR
interdependencies (hard to do it alone)
seeing potential in working across value chain
employees believe in the agenda
Roles & Responsibilities
workshops for clarifying roles and responsibilities in the begining
Role of partnerships in day-to-day business
Municipality provides frame, playfield for experimentation
role of EU only in funding and communication with coordinators
Private actors can push innovation agenda among competitors
Public sector communicates towards citizens
collecting waste: public vs. private responsibility (extended producer responsibility)
partners outside of value chain potentially providing an insight into future possibilities from different perspective
public actor can provide special permission
Public sectors role to create behaviours in society
advantage of public sector's test facility (rare)
division of responsibilities based on the value chain role
public actor taking different roles in each partnership (lead vs participant)
municipality would welcome more partnerships where they are not the lead
the initiator typically takes the lead role
initiator has greater responsibility and several roles
Mutual trust
Knowledge sharing = trust
Covid-19/virtual interaction hinders trust-building
competitors = limited knowledge sharing (even with feeling trust)
experience with the other partner's competency creates trust in the project
previous experience creates trust
openness and willingness to collaborate lead to trust
facilitator listening and respecting everyone
trust is more important than legal agreements

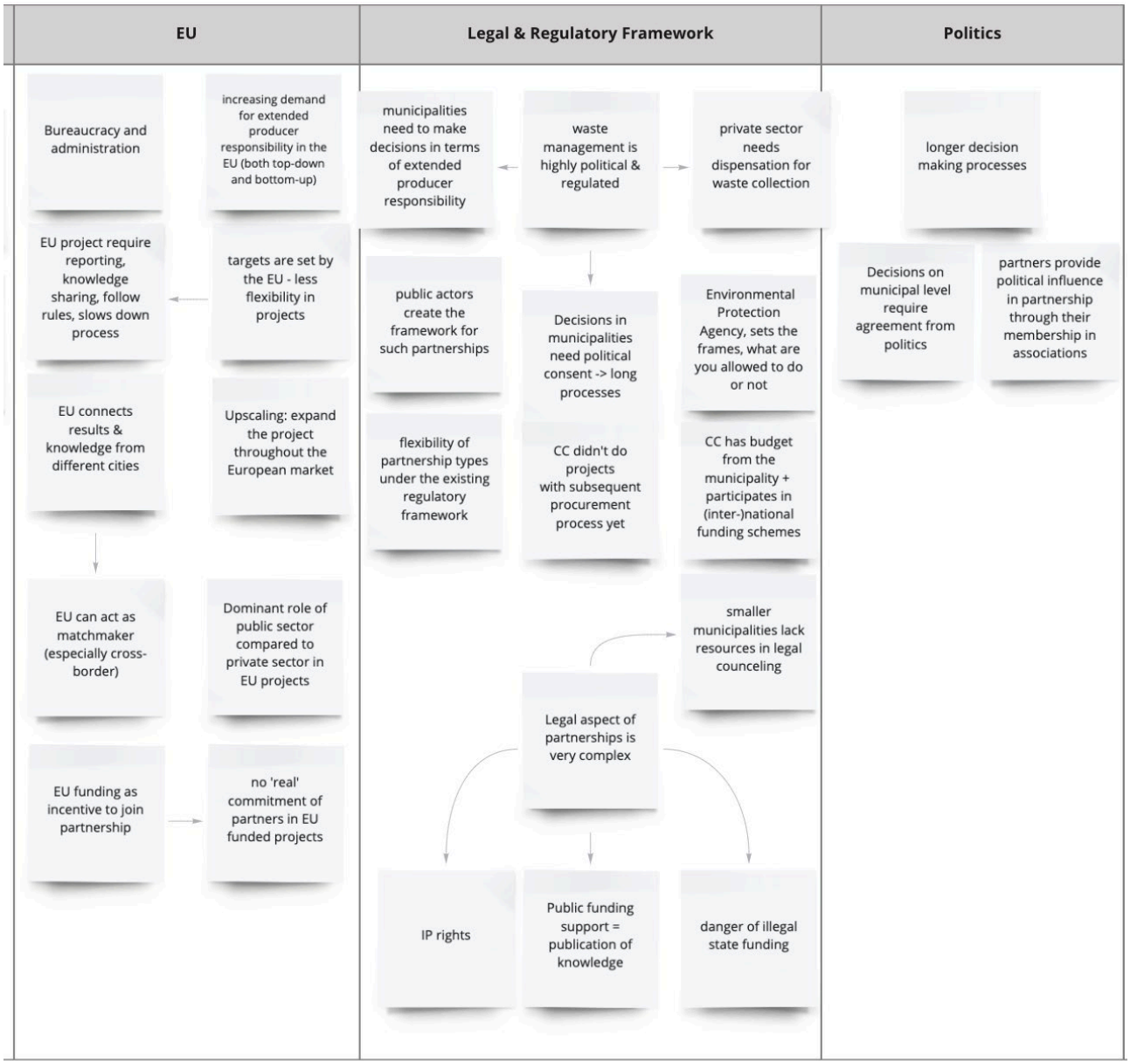

Mutual understanding
Power relations
Benefits (Collaborative Outcomes)
mutual understanding = feeling of safety and trust
create mutual understanding through shared goals and vision in the beginning
mutual understanding of sustainability, circular economy, recycling; same green agenda
Investing time in creating a mutual understanding as success factor
working groups contribute to mutual understanding among individual partners
Having personal relations/previous experience before partnership enables collaboration and innovation
Covid-19/virtual communication hinder mutual understanding
important to understand the different reasons to partner up
only choosing partners from prior relationship as barrier for innoovation
collaborating increases possibility to partner up again
different objectives and understandings along a value chain can be a barrier
good working climate is an enabler for innovation
importance of understanding that collaborating is the best option
importance of no hiearchy
importance of feeling of respect among partners
external communication as a unit (same sized logos, shared partnership website, etc.)
importance of perception of a shared project
Initiator develops the idea alone
facilitator/initiator open to partners' input
potential perception of the public actor as a "neutral" partner suitable for project manager
facilitating a good atmosphere to share knowledge
keep independence from the partners to not drive away other organizations
Resource allocation doesn't impact power relations
combine the best of both worlds (public & private sectors)
including competitors to join forces and reach more users
create awareness about the issues within organization
getting inspiration
using the learnings in future projects
Building new relations & partnerships during the project (business opportunities)
generating new knowledge
learning from each other
understanding the entire value chain
getting a sense of complexity of the issue
providing feedback about possibilities to the political level
satisfaction from making it happen


Drawbacks & Improvements
Future steps
Innovative Outcomes
adjust governmental regulations (support uptake of recycled material)
implement more co-creation
competitors would prefer to not not involve a competitor
inviting more partners with different points of view
not doing just pilots but actually scaling up
EU projects don't ensure 'real' commitment of partners
Technical possibility vs. economic feasibility
missing discourse about upscaling /economic aspect
EU projects: long and bureaucratic
partners follow their own interests
difficulty to institutionalize innovation in public sector
covid19
risk-averse public sector
smaller municipalities don't have enough resources
need to involve them because of their jurisdiction over waste
CPH municipality is strong, is innovative, has vision and resources
public sector provides the framework in which private actors operate
the public sector should allow the industry to be more innovative
align waste-collection schemes
Clarify: who is responsible for waste collection (extended producer responsibility)
political discussion
disseminaton of the practice in the industry
Covid-19
new waste reform
Economic feasibility vs. technological feasibility
hinders
without upscaling, business falls back in normal routine
scaling up
Financial resources needed for upscaling
pushing tests from one partnership to a bigger scale in another one
Not individual but joint upscaling
involve more stakeholders, municipalities (+competitors) for upscaling
(inter-)national wide upscaling
potential in collaborating in EU
lack of resources in Denmark (waste, plants)
establish new pilots in other sustainability areas with same partners
EU projects: knowledge transfer to implement solutions elsewhere
communication with partners about future steps
development takes time
need for a subsequent tender to buy a prototype
Demonstrate technological feasibility
Demonstrate economic feasibility (partially)
"disrupting the entire sorting business with this technology"
create media attention and awareness among users
Include users in recycling (insulin Pen)
Take-back scheme. Extended producer responsibility (insulin pen)
Process improvements (Design Guide)
knowledge from the pilot
a shared business model
partnership as innovation: involve all partners along the value chain, closing the loop


Collaboration with Private Sector
Collaboration with Public Sector
Interdependence
private companies act faster
need to ensure there is not a monopoly
public & private sector have different decision making processes and interests
insecurity and instability of the private sector depending on the financial situation
public sector is dependant on private sector in developing new technologies
municipality collaborating with actors who can help reach political goals
public sector benefits from learning from the private sector (inspiration, innovative approach)
"we won't make the transition for circular economy using the same type of thinking"
IPR challenges
balance between sharing knowledge in the industry and keeping secrets
private actors join partnerships to be better at what they do
private actors join partnerships for business opportunities
Financing
Private sector has human & financial resources needed
SMEs don't have enough finance
difficulty finding partners who don't want to just sell solution but want to co-finance development
"private organizations need to understand the reality of public funding and political organizations"
need for co-financing from bigger companies
private sector holding expenses for their own collection schemes is a good thing for the municipality
need for more private initiatives where the public sector doesn't have to lead
EU projects: lots of reporting and rules, slows down process
EU projects: knowledge sharing as barrier for collaboration
public sector needs to be more flexible and agile
different roles of the higher/lower level public sector
public sector implements the goals and vision from the top
power relations , hierarchy, bureaucracy and little decision making power in public sector are an issue
tension between the goals and drivers in public and private sector
beneficial to understand how the municipality works (waste management)
drawbacks of tendering and regulations around IP rights
public partner more neutral role because no commercial interest
public sector creates behaviours in the society
private development can benefit from accessing municipal resources (waste)
political debate about extended producer responsibility
risk-averse public sector is a barrier to innovation
good to have the public sector putting pressure on the private
complex societal challenges requires to work with the public sector
need to work on a shared green agenda with the public sector
interedependence in circular economy development
benefits of combining the different skills among the public and private sector
some projects dependent on users
Upscaling requires even more collaboration
collaboration requires shared interests
PPIs for solutions that do not exist on the market yet
Circular Economy requires collaboration along the value chain
Environmental issues require collaboration
Transition towards circular economy needs different ways of thinking
Need to involve municipalities to create a customized solutions (challenge owners in charge of waste mngmt)
Complex challenges require joint development of solution, not just contracting
Public sector needs partners for technology development
Need to combine different mindsets
Public sector has to understand the trends in development outside of the municipality
Public sector needs partners for co-financing


Societal & Environmental Challenges
Households generate lots of waste
Sending waste to landfills outside of Europe
Different waste management systems in different cities/countries
Packaging (especially plastic) is an important and highly discussed topic
waste management involves different stakeholders -> complex problem
need to rethink design of products
environmental challenges need collaboration (jointly develop solutions that are good for everyone)
Question of extended producer responsibility
waste management requires tailor-made solutions
Environmental agenda gains importance among private actors
Public sector's role to teach citizens in sorting waste
Climate Crisis as biggest shared challenge of our generation, of the Danish society
Circular Economy
join partnership to reach company goals in CSR / CE and innovation
Increase reputation through CE engagement
Company's need to take responsibility of their waste (EPR)
Circular economy becomes increasingly important in Danish society
Danish municipalities highly engaged in CE topic
recycling of plastic and organic waste in the focus for new waste mngmt innovations
Circular economy requires collaboration
Increased citizen expectations
customers put demands on producers
citizens/customers' preferences drive the development
users want conveniet solutions
sustainability, reusability increasingly gets important for custoemrs


Other Trends
Sustainability
Covid-19
Danish tradition in public-private collaboration
companies looking for innovation in their CSR agenda
new technological possibilities
digital technologies
value and practice alignment within an industry
Climate crisis as shared societal challenge in DK
PPPs to tackle the societal challenges
Increasing awareness and importance of sustainability in society
Sustainability increasingly part of company strategies
private actors increasingly take responsibility in terms of sustainability
Sustainability focus in organization = good reputation
Employees like working for companies with a sustainable agenda
ESG-factors are very important for investors
online-meetings more time efficient
vs.
informal meetings, networking are hindered
Covid challenges upscaling
trust, relationships and understanding is hard to build through the screen
covid hinders co-creation
Covid changed time-frame ("things move slower")


EU
Legal & Regulatory Framework
Politics
Bureaucracy and administration
increasing demand for extended producer responsibility in the EU (both top-down and bottom-up)
municipalities need to make decisions in terms of extended producer responsibility
waste management is highly political & regulated
private sector needs dispensation for waste collection
longer decision making processes
EU project require reporting, knowledge sharing, follow rules, slows down process
targets are set by the EU - less flexibility in projects
public actors create the framework for such partnerships
Decisions in municipalities need political consent -> long processes
Environmental Protection Agency, sets the frames, what are you allowed to do or not
Decisions on municipal level require agreement from politics
partners provide political influence in partnership through their membership in associations
EU connects results & knowledge from different cities
Upscaling: expand the project throughout the European market
flexibility of partnership types under the existing regulatory framework
CC didn't do projects with subsequent procurement process yet
CC has budget from the municipality + participates in (inter-)national funding schemes
EU can act as matchmaker (especially cross-border)
Dominant role of public sector compared to private sector in EU projects
smaller municipalities lack resources in legal counceling
Legal aspect of partnerships is very complex
EU funding as incentive to join partnership
no 'real' commitment of partners in EU funded projects
IP rights
Public funding support = publication of knowledge
danger of illegal state funding

Constructing Thematic Networks

In the third step of Attride-Stirling's (2001) approach of thematic networks analysis, we detached from our initial coding framework and rearranged the themes into new groupings of low-order basic themes, middle-order organizing themes, and high-order global themes (see Figure 2). As a result, we constructed seven thematic networks – human-centeredness (see Figure 3), multidisciplinarity (see Figure 4), learning (see Figure 5), alignment (see Figure 6), interaction (see Figure 7), resources (see Figure 8), and legal and regulatory context (see Figure 9).

Figure 2: Constructing the Thematic Networks. Own illustration[4].

[4] Each of the seven thematic networks is depicted in more detail on the following pages.

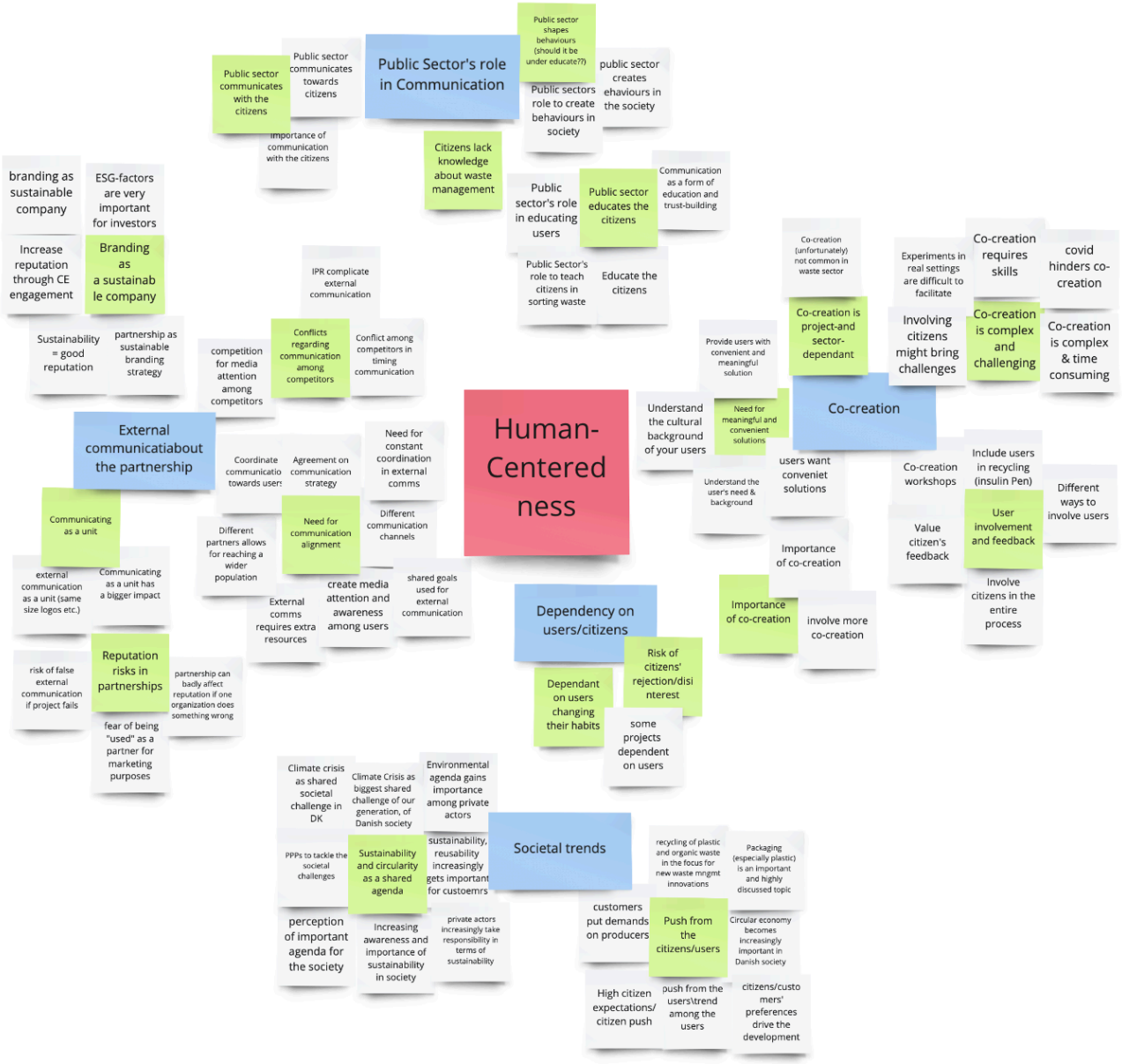


Figure 3: Thematic Network of Human-Centeredness. Own illustration.

Figure 4: Thematic Network of Multidisciplinarity. Own illustration.

Figure 5: Thematic Network of Learning. Own illustration.

Figure 6: Thematic Network of Alignment. Own illustration.

Figure 7: Thematic Network of Interaction. Own illustration.

Figure 8: Thematic Network of Resources. Own illustration.

Figure 9: Thematic Network of Legal and Regulatory Context. Own illustration.

Appendix B

Appendix B contains confidential materials, and is therefore placed in a separate document that is not publicly available.

Appendix B consists of:

Partner Interviews

- Aage Vestergaard Larsen. Interview with Bo Jacobsen. 2021, March 19
- Amager Ressourcecenter. Interview with Ida Leisner. 2021, March 22
- Circular Copenhagen. Interview 1 with Jonas Åbo Mortensen. 2021, January 28
- Circular Copenhagen. Interview 2 with Jonas Åbo Mortensen. 2021, February 16
- Circular Copenhagen. Interview 3 with Jonas Åbo Mortensen. 2021, March 17
- Circular Copenhagen. Interview 4 with Jonas Åbo Mortensen. 2021, March 25
- Coop Danmark. Interview with Mathias Hvam. 2021, April 12
- Danmarks Apotekerforening. Interview with Birthe Søndergaard. 2021, March 11
- Dansk Teknologisk Institut. Interview with Bjørn Malmgren Hansen. 2021, March 7
- Diabetes Foreningen. Interview with Thomas Elgaard Larsen. 2021, March 22
- Distribution Denmark. Interview with Trine Hansen. 2021, March 18
- IHP Systems. Interview with Lars Mensal. 2021, March 22
- Nomeco. Interview with Jane Wehlast. 2021, March 18
- Novo Nordisk. Interview with Niels Otterstrøm Jensen. 2021, March 2

Expert Interviews

- C40 Cities. Interview with Kathrin Zeller. 2021, March 10
- EIT Climate-KIC Nordic. Interview with Jakob Stolt. 2021, March 10
- Leaderlab. Interview with Toke Sabroe. 2021, March 4
- REFLOW. Interview with Cristiana Parisi. 2021, March 11