The consolidation of

CIRCULAR

project dynamics in an evaluation tool

to help members of project teams to learn about the integration of project dynamics for circularity in construction projects to stimulate the realization of circular ambitions.

Cornelis van Dijk

June 2022

The recording of each session or interview for the purpose of this research can be summoned from the author. However, due the agreed informed consent, the recordings cannot be shared without a thorough approval. Reports on the sessions and interviews can be found in the appendix.

Graduation Thesis

'The consolidation of circular project dynamics in an evaluation tool'

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Preface

In this report I present my research, conducted during my graduation for the master track Management in the Built Environment at the TU Delft. In the research I developed an evaluation tool that helps members in project team to learn about the integration of project dynamics for circularity in construction projects to stimulate the realization of circular ambitions.

In the beginning of the research the tool is developed derived from literature. During the research three cases are used to validate and further develop the tool. To obtain data for the development, each case is researched with two focus group sessions. Three interviews and a final focus group in the form of an expert validation provided the additional data required to develop the final tool.

Concurrent to the research, I did my internship with Bureau Bos, which is an architectural firm that has an integral approach of design, offering feasibility research, consult on building physics, management of the building process and maintenance. In the internship I was able to work along with a project team and learn from their expertise and how an integral design process is conducted. Therefore I want to thank my colleagues at Bureau Bos for integrating me in the work process, the valuable lesson derived from this. Also my gratitude for the hospitality in the company and the flexibility that made me able to work on my research.

For the research I had guidance from three mentors, who I want to thank for helping me to specify my research, provide input to the research approach and staying critical on the progress that was made. The flexibility to discuss the research or specific project dynamics was very helpful for my progress. It gave me the opportunity to work independently, but arrange a meeting when consulting was needed.

A word of gratitude is also deserved for the participants that helped me in this research through the focus groups, interviewees, and expert validation. Thanks for reserving time for this research, being open to provide valuable insights, but also for having a critical perspective on the research itself.

I want to finish this preface with a quote about the difference between hope and optimism. That is because, despite all the development in the world, I am hopeful that we will reach a sustainable future in the following years and decades. I am curious to see how this research and the developed tool will take place in the built environment and if it can be of added value for the transition towards a circular economy.

Hope and optimism

''Hope is a verb with its sleeves rolled up. Hopeful people are actively engaged in defying or changing the odds. Optimism leans back, puts its feet up, and wears a confident look knowing that the deck is stacked''

(Orr, 2007)

Let's be hopeful together!

I wish you a great reading experience,

Cornelis van Dijk

Content

1 Introduction

This chapter explains the context of this research, describing the research problem and how this resulted into the research aim and motivation. Then an introduction is given on the theories and concepts used in this research to reach this aim. Derived from all this a research approach is developed along with the research questions.

1.1 Context and problem

In the second quarter of this year, the Intergovernmental Panel on Climate Change (IPCC) released their sixth assessment report (AR6) on the topics of global warming, climate change and the risks it brings to our health, society and planet. The new report shows that the total CO2 emissions worldwide remained growing up to and including 2019 (IPCC, 2022). Rood and Hanemaaijer (2017) speak their concerns on the increasing extreme weather, the loss of biodiversity and the incremental risks on our health. With an global temperature rise of 1,5 degrees, it is estimated that three billion people will live in vulnerable areas around the globe. This means a lack of food security and water safety. This is all in direct relation to the climate change caused by the exhaust of greenhouse gasses (IPCC, 2022; Rood & Hanemaaijer, 2017).

In the following decades a balance ought to be found between ecological growth, the environment and overall health of people. This would require new strategies on efficient use of raw materials and products (Winans et al., 2017). One of these strategies is the transition towards a circular economy (CE), which helps to lower production and consumption rates (Mulhall & Braungart, 2010). Kirchherr et al. (2017) provides a definition for CE, which is adopted for this research: "A circular economy describes an economic system that is based on business models which replace the 'end-of-life' concept with reducing, alternatively reusing, recycling and recovering materials in production/distribution and consumption processes, […] with the aim to accomplish sustainable development, which implies creating environmental quality, economic prosperity and social equity, to the benefit of current and future generations'' (Kirchherr et al., 2017, pp. 224-225). However, research on CE tends to focus mainly on the short-lived manufactured products and leaves research on circular buildings, due to the complexities in the built environment, often neglected (Pomponi & Moncaster, 2017). Therefore it can be stated that some barriers remain unsolved.

Kirchherr et al. (2018) concluded that the barriers on the technological dimension were the least pressing for the transition towards CE. But barriers on the cultural dimensions appeared to be most pressing and slowing down or even cease the transition (Kirchherr et al., 2018). Kirchherr et al. (2018) emphasized on two main barriers in this dimension, which are a 'hesitant company culture' and secondly 'lacking consumer awareness and interest' (Kirchherr et al., 2018). Hart et al. (2019) mentions

the lack managerial skill as pressing barrier for the transition and Gerding et al. (2021) adds the lack of required knowledge in conventional members in project teams of construction projects to the list (Gerding et al., 2021; Hart et al., 2019). Due to the lack of required knowledge members in project teams rely too much on experts (Gerding et al., 2021).

From a private perspective, barriers are considered as well. In a report from the Dutch national bank ING (2020), called 'Rethinking the road to the circular economy', six additional barriers are presented:

1. The inclusion of environment externalities makes CE more expensive.
2. Transaction and operational costs are higher in a CE.
3. Production volumes are too low for circular markets to emerge.
4. The lack of innovative nature and willingness to change towards a new economy.
5. The risks that go with the linear economy are often overlooked
6. Some CE business models are perceived riskier than traditional business models.

1.2 Research motivation and aim

To participate in the transition towards CE effective, the goal of this research is to contribute in finding the solution for the issue of the lack of knowledge about circularity in conventional members in project teams, mentioned by Gerding et al. (2021). The solution to this barrier could become a catalysator to accelerate the implementation of CE in the built environment. Experts on circularity in project team would become superfluous, because the members can implement circularity themselves, which results in circularity becoming common practice (Gerding et al., 2021).

To be more specific, this research aims to develop an evaluation tool that helps members in project team to learn about the integration of project dynamics for circularity in construction projects to stimulate the realization of circular ambitions. A case study research is conducted to gather insights on circular project dynamics for construction projects, which are used to develop and validate the tool. The tool should enable team members to take an active role in the transition towards a CE. Therefore it is required that the tool is developed during the research and can be implemented after the completion of it. In addition, the tool should be easy to use, therefore aiming on consolidation of project dynamics on a single artifact. To make it accessible for project teams, the tool can be printed on paper and is developed on an A3 format.

The evaluation tool is developed for members in project teams of construction projects and should be used together with the members. The tool is to evaluate both the preparation of the project and the process that follows. Therefore the tool is initially developed for the members that are present at the beginning of a project, but new members can be integrated in the evaluation process as well, once

they are added to the team. Members of project teams are considered to have a specific task within the project, for example the architects that designs the project or the contractor who builds it. The client is also considered a part of project team, because he/she has the task to convey their overall ambitions.

1.3 Introduction theories and concepts

For this research several concepts and theories are consulted to substantiate the development of the tool, but also for the approach of this research. To determine the latter, the model of the bottom-up and top-down approach of Pomponi and Moncaster (2017) is used, who determined six dimensions of building research, presented in figure 1. In addition, the difference between the implication of optimism and hope, derived from Frumkin (2022) are used - see section 1.4 Research approach. To better understand learning as a practice, a study has been conducted on theories and concept on this matter which are further explained in section 2.3 Learning theories and concepts. First the concept of first- and higher order learning, from Brown et al. (2003), to better comprehend what learning is as a practice. The second theory is used to provide that the tool enables effective learning, which is about learning processes. In section 2.3, the learning processes of single- and double loop learning are explained, based on the definitions of Argyris and Schon (1974). The loops provide, similar to first- and higher order learning, a comprehension of learning as a practice, but in addition provide the insight on how to accomplish this in a learning process. The third theory that is used, is about the learning mechanisms of van den Bosch and Rotmans (2008), which are deepening, broadening and scaling up. These learning mechanism explain how the members of project can learn. Then, in order to distinguish the effects of learning as individual member of a team or learning as a group, literature on learning levels is studied. The learning levels of Crossan et al. (1999), which are individual-, group- and organizational level learning, are used to better understand the reasoning behind this. Finally, a fitting learning strategy is required. Romme and Van Witteloostuijn (1999) explain that the learning strategy is the result of triple loop learning, which is therefore also discussed in section 2.3. For the learning strategy of the tool, the strategy of project based learning is investigated, based on the research of Liu (2021).

1.4 Research Approach

As addressed the previous section the approach that is selected, is for the first part derived from the conceptualization of a top-down- or a bottom-up approach based on the six dimensions in building research of Pomponi and Moncaster (2017), see figure 1. The cultural dimension of Kirchherr et al. (2018) shows similar traits with the societal and behavioral dimension in figure 1 and can therefore be considered located on the bottom of the circle. A top-down approach would provide indirect solution,

because this means that the solution for the cultural barrier is solved through the governmental, economic, technological and/or environmental dimension(s). A bottom-up approach intends to be more direct, providing a solution directly within the cultural dimension.
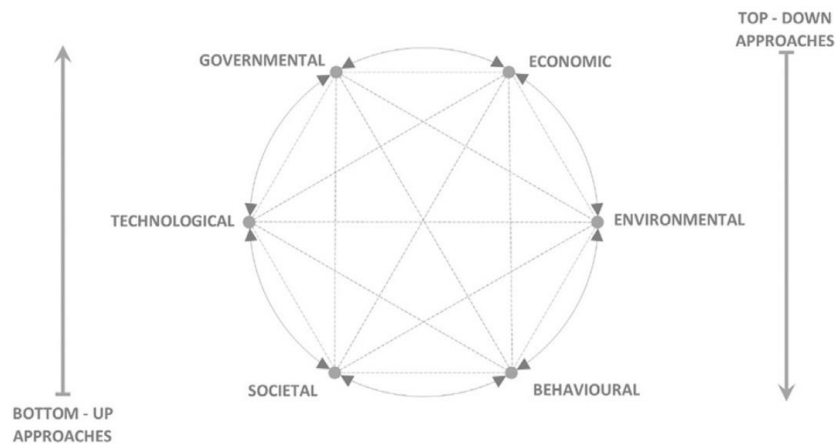
Figure 1: The six dimensions for building research with top-down and bottom-up approach (Pomponi & Moncaster, 2017, p. 715)

The approach of the research is for the other part based on the choice between hope and optimism. Frumkin (2022) describes optimism as having confidence in a good outcome, knowing that the odds will be in your favor. Whereas hope is more goal-oriented and requires an active way of thinking. An individual with hope invests time and energy to achieve this goal and defies or changes the odds. An optimistic person believes that things will go well automatically (Frumkin, 2022). This research aims to provide a solution for the cultural barrier, described earlier by Gerding et al. (2021). While reaching this aim it intends to create hopeful members in project teams, who can take an active role in the transition towards CE. It is therefore that this research chooses a bottom-up approach, as this offers the solution directly within the cultural dimension and enables members in project teams to take action themselves.

1.5 Research Questions

The fulfil the aim of this research, the evaluation tool consolidates project dynamics that were considered as success factor or as possible improvements for former circular construction projects. These dynamics can be steps that are taken, decisions at specific phases or important issues that are discussed or researched. Considering the criteria and the type of dynamics the main research question is as follows:

> *How are project dynamics for circularity in construction projects consolidated into an evaluation tool that helps members in project teams to learn about the integration of these dynamics in construction projects?*

The main research question is answered through developing the tool during this research. The initial tool is based on literature (V0), later version (V1-V6) are developed and validated through focus groups and interviews. The final version of the tool (Vfinal) is validated through an additional focus group, that serves as an expert validation, see following chapters for more elaboration. During the sessions additional insights and project dynamics are gathered to substantiate the development of the tool. It is assumed that not all data gathered through the case studies is useful for the tool, which requires critical thinking to select what to add and/or delete. Therefore the following sub question is asked:

1 Which insights and project dynamics are useful for integration in the tool and what can be deleted from the tool?

This question can result in project dynamics for the tool being added based on affirmative findings or deleted because of contradictory findings. The project dynamics that remains in the tool during the development must always be validated and if necessary improved based on the newly gathered findings. For this reason the following sub question is raised:

2 How could the interpretation of the project dynamics in the tool be improved to better represent the available findings?

The content of the tool is able to change during the developments by adding, deleting or improving the project dynamics. But it is also considered that changes are required on how these are visually presented and structured. The following question enables to be critical on how the data is organized in a clear manner that is easy to understand by the user of the tool:

3 How could the content of the tool be presented more clearly for the user of the tool?

1.6 Thesis Outline

The report starts in this chapter with the context of this research, explaining the research problem, motivation, an introduction of theories and concepts and how this results into the research approach and -questions. In the chapter two the theories and concepts are explained further. Also a relevant overview is provided substantiated with literature on circular- economy and project dynamics. An additional study about design science research is the foundation for the research design, which is elaborated in chapter three. In this chapter the development of the initial tool V0 is explained and the approach of collecting and analyzing data is presented for further versions of the tool. The chapter also presents the research cases for this research. During research itself data has been received and analyzed. The findings are described in chapter four. It shows the findings per version of the tool V1 up to and including VFinal and explains how these contribute to the development of the tool. In the chapter that follows, chapter five, the findings and developments are mirrored to the literature and

critically observed on how to interpretate them. In chapter six the research is concluded by providing a short summary of the most important findings, the answer to the main research question and the value of the answer, discussing the scope and limitations of it. Also recommendations are given for future researches. In chapter seven a final recommendation is given for future tool developments and users of the tool. The report finalizes with a reflection.

2 Literature review

This chapter aims to provide a scientific substantiation for the context of the research. It puts the linear economy next to the circular economy and explains how circularity could play a role in the built environment. It elaborates on dynamics in project teams that influence the success of a circular construction project. Then it explains learning theories and concepts that are used to substantiate the workings of the evaluation tool

2.1 Circular Economy

The economic environment can be split up into three levels, micro, meso and macro. For the built environment these levels are correspondent. The smallest level, micro, focusses on the material dimensions and the supply chains, but this also includes businesses and consumers. The meso level is where these materials come together as buildings or industrial parks. The largest scale is the macro, being the urban agglomerates (Pomponi & Moncaster, 2017).

Linear economy

Traditionally these levels co-exist in a linear economy. In this type of economy, raw materials are taken, products are made with these materials and after their lifecycle the product and its materials is seen as waste. This is what is called the take-make-dispose economy (MacArthur, 2013). Stahel (2016) compares the linear economy with a river, picking up materials along the way and increase the value through its lifecycle into a product. After buying the product, the new owner is responsible for what to do with it (Stahel, 2016). Due to this, humankind is exhausting the earth and according to McDonough and Braungart (2013) this exhaustion could be even a bigger threat to us then greenhouse gasses. They emphasize on a new way of design. Not Cradle to Grave, but Cradle to Cradle (McDonough & Braungart, 2013).

Circular economy...

Cradle to Cradle is a concept of circular economy, in which materials exist in a biological and technical loop, with minimal loss of quality and leakage (McDonough & Braungart, 2013). Pomponi and Moncaster (2017) state that this concept, is the underlying principle for the butterfly model of the

Ellen MacArthur Foundation (2013), see figure 2. The left side is the biological cycle, which explains the cycle of how waste is used to regenerate farming opportunities to produce feedstock for the consumer. In this cycle materials are designed to re-enter the biosphere safely. The right side is focused on the technical economy, showing the cycle of how raw materials can be reused into the economy, designing materials to remain of high quality and circulating them without entering the biosphere (MacArthur, 2013).
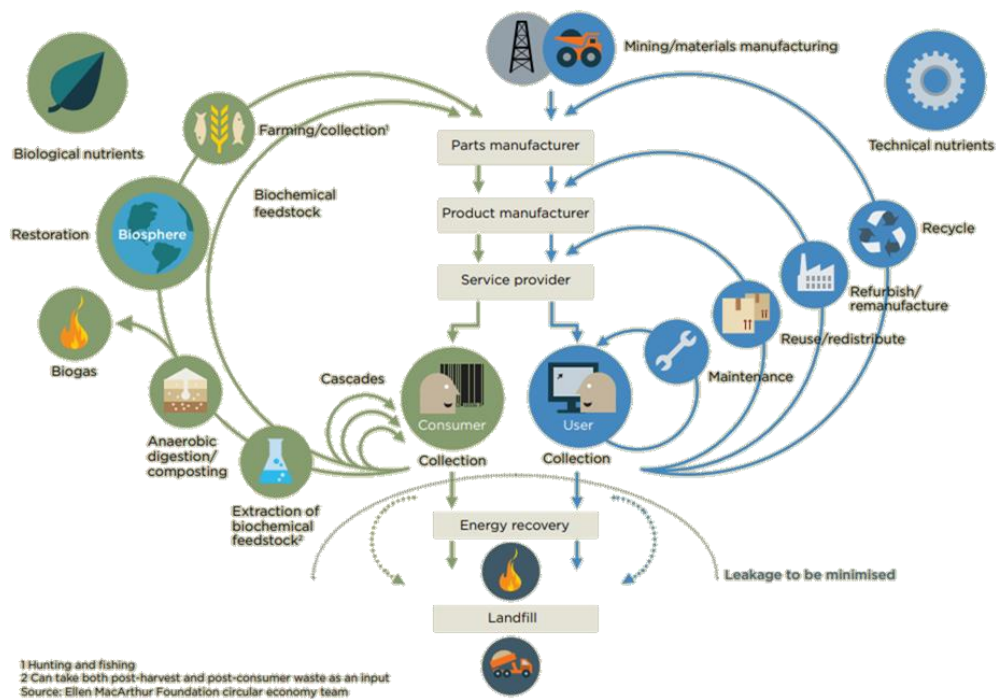
Figure 2: Butterfly model for a circular economy (MacArthur (2013, p. 24))

This relatively new type of economy has its origin with Boulding (1966), who suggested to implement a cyclical system instead of the current linear system. This suggestion looks little as what is understood with circular economy nowadays, but it did start further development of sustainability (Sariatli, 2017). It resulted in the development of the spiral-loop (now called closed loop) by Stahel (1982). And in 1990, Pearce and Turner (1990) were the first to mention the phrase of a circular economy (Sariatli, 2017). In the previous section, the linear economy was compared with a river by Stahel (2016). He compares the circular economy to a lake, keeping the materials in one place and rotating it in one system. This system reprocesses goods and materials and generates jobs, while reducing consumption waste (Stahel, 2016).

Generic strategies on circularity are often described in R-models. Kirchherr et al. (2017) came up with a 4R-model, consisting of reduce, reuse, recycle and recover. But other models exist that go up to nine

strategies. The 9R-model, which introduces the strategies of refuse, rethink, repair, refurbish, remanufacture and repurpose, in addition to the 4R-model (Potting et al., 2017).

Bocken et al. (2016) addresses that these strategies go hand-in-hand with innovative business models that facilitate circularity. DaSilva and Trkman (2014) explain a business model as selecting the right combination of resources and associated actions. It is often confused with revenue models, which can be defined as the way financial value is captured by a company (DaSilva & Trkman, 2014; Zott & Amit, 2008). A business model entails how a company is capturing value in its integrality. Therefore also considering the impact on the industry and economy the company operates (DaSilva & Trkman, 2014). Key elements of circular business models are slowing, narrowing and closing resource loops. Slowing resource loops, means extending a life cycle of a product, with for example remanufacturing. Narrowing refers to using less resources per product. Closing down resource loops, means to recycle or reuse and to connect the post-use and production phase (Bocken et al., 2016). Leising et al. (2018) see the business models as important means to implement a collective approach in the supply chain, called the value creation, in which agreements can be made for the lifetime of building, including the end of life stage (Leising et al., 2018)

The process of circular business model innovation (CBMI) looks for changes in existing business modeling tools and explores their suitability in the context of circularity (Mentink, 2014). Mentink (2014) proposed in his research the idea of understanding the roles of suppliers and stakeholders and the integration of a business model for the whole supply chain, similar to Leising et al. (2018); (Mentink, 2014). Antikainen and Valkokari (2016) created a framework which emphasizes on evaluating the existing business model canvas against the business ecosystem (trends, drivers and stakeholder involvement) and sustainable impact (sustainable requirements and benefits) (Antikainen & Valkokari, 2016).

Van Der Laan (2019) published an article explaining four business model and how they stimulate a CE. The business model that stimulated a circular economy the most is 'Pay per Use'. In this model the user pays a variable compensation for each use of a product. Another model in which the supplier keeps the ownership over its product is 'Rent'. This model is equal to 'Pay per Use', except the users pays a fixed compensation. If a user wants to own a product, the user and supplier can agree on a Buy-Rebuy, in which the user buys the product at t=0 and the supplier guarantees it will rebuy on a certain moment. The model with the least circular stimulation is the lease model. In this model a lease company buys the product from the supplier, and then leases it to the user in a rent model (Van Der Laan, 2019).

…for the built environment

A circular building is a 'building that is designed, planned, built, operated, maintained, and deconstructed in a manner consistent with CE principles' (Pomponi & Moncaster, 2017, p. 711). Eberhardt et al. (2022) concluded assembly and disassembly as most occurring circular design strategies for the built environment in literature. Followed by material selection and adaptability. Symbiosis and sharing were the least occurrent. In another literature review, Joensuu et al. (2020) used a thematic categorization for approaches of circular economy practices in the built environment, at first management for sustainable cities, secondly urban services and consumer practices and at last cleaner production and construction (Joensuu et al., 2020). Derived from the study they were able to specify the themes further, with more specific approaches. To manage sustainable cities, Joensuu et al. (2020) emphasize on starting with circular objectives and a strategic plan for CE. Then they elaborated on the implementation of sustainable development and methods for evaluating sustainability. For the second approach, Joensuu et al. (2020) conclude to focus on reduction of waste and consumption of consumers, promoting reuse and recycling in the waste collection and a closed cycle and recovery of valuable resources. As specification of the third approach, the findings of Joensuu et al. (2020) suggest to broaden the Life Cycle Approach (LCA) to achieve a low-carbon built environment. LCA is a methodology for evaluating the environmental load of processes and products during their life cycle. Also they state that building materials should be improved to be more eco-friendly through industrial and urban symbiosis (Joensuu et al., 2020). The latter is a concept in which industries engage collectively towards a shared benefit, for example sharing resources, energy and by-products (Chertow, 2007). In the article from Joensuu et al. (2020) the top-down and bottom-approach of Pomponi and Moncaster (2017) is also mentioned, addressing that for the transition a balance must be sought between both (Joensuu et al., 2020). The risk of solely top-down approaches is that governmental organization misunderstand the objective of CE, due to for example confusing actors or conflicting policies (Zhang et al., 2010). Joensuu et al. (2020) concludes that innovation-positive politics should be defined to create simple conditions that stimulate CE and leaves room for innovation. But still, the transitions towards CE is a cross-disciplinary development. Therefore networking, knowledge sharing and supply chain management are required, asking for more commitment of stakeholders (Joensuu et al., 2020).

At last, they mention the transition that is required for a proper waste management in the construction industry (Joensuu et al., 2020). Which is according to Adams et al. (2017) also a popular subject in research and practice, addressing it as end-of pipe solutions (Adams et al., 2017). In an empirical study of Adams et al. (2017) aspects of a circular economy are linked to the stages of a building lifecycle, from design to end-of-life, see figure 3.

Life cycle stage	Circular economy aspect
Design	DfD Design for adaptability and flexibility Design for standardisation Design out waste Design in modularity Specify reclaimed materials Specify recycled materials
Manufacture and supply	Eco-design principles Use less materials/optimise material use Use less hazardous materials Increase the lifespan Design for product disassembly Design for product standardisation Use secondary materials Take-back schemes Reverse logistics
Construction	Minimise waste Procure reused materials Procure recycled materials Off-site construction
In use and refurbishment	Minimise waste Minimal maintenance Easy repair and upgrade Adaptability Flexibility
End of life	Deconstruction Selective demolition Reuse of products and components Closed-loop recycling Open-loop recycling
All stages: management of information including metrics and datasets	

Figure 3: Circular economy aspects across a building's life cycle stage (Adams et al., 2017, p. 17)

CBMI can also result in the creation of new types of business models. Visnjic et al. (2016) researched the opportunity of servitization, which means that manufacturers stay owner of their product and provide it as a service to the market. Business models developed for this concept show the possibility of constraints on profitability in the short term, but produce accumulated knowledge in the long term (Visnjic et al., 2016). The economic department of the ING Bank (2015) states that this concept promotes incentives for suppliers to create high quality and long lasting products fit for reusability (ING, 2015).

2.2 Dynamics for circular construction

The business models explained in section 2.1 are an example of how the economy can be shaped to support the transition towards a CE. For this research further understanding is required to be able to solve barriers on the cultural dimension. For this, insights can be derived from the research of Kooter et al. (2021). Figure 4 illustrates the interplays between three clusters of dynamics in circular construction projects, which are prerequisites, temporal dynamics in interorganizational projects and contextual influences.
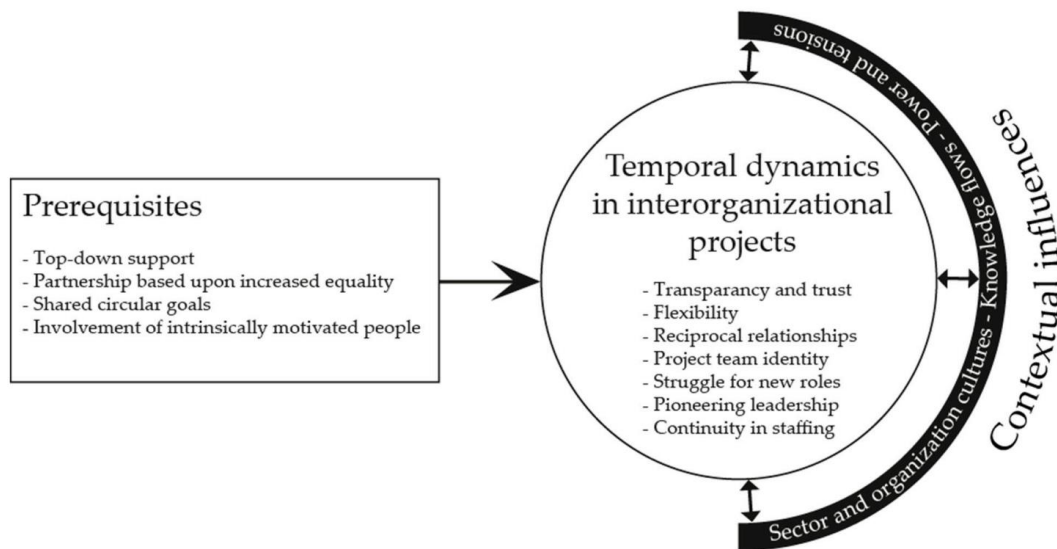
Figure 4: The interplay between the dynamics of interorganizational projects that are relevant in the realization of circular ambitions in construction projects (Kooter et al., 2021, p. 7)

The first cluster mentioned are the prerequisites for a circular construction project. The prerequisites are needed for formulation and realizing the circular ambitions, starting with the support from higher levels of the organization. The higher levels can show support by using policies, which is more formal, and by encouraging certain behavior on the work floor, which is more informal. Also it is required that partnerships are considered as equal, sharing the circular ambitions and risks it upholds. Therefore it is also important that the visions are explicit with clear goals, to prevent the vision to lose value during the process. The last prerequisites Kooter et al. (2021) mention is that for realizing circular ambitions, the project should involve intrinsically motivated people.

The second cluster provides insights into the temporal dynamics in interorganizational projects. The first dynamic in the list is transparency and trust, which is required for flexibility, to achieve higher quality and to stop greenwashing in a project. Transparency and trust among members is reached when they dare to be open an vulnerable and create their relation based on trust. Due to uncertainty created by circular ambitions and the general lack of practical knowledge projects have to be viable. therefore flexibility is a crucial dynamic in interorganizational projects. The necessity of equal partnerships also translates into members in project teams sharing responsibility, not blame each other and act interdependently. In addition to this, Kooter et al. (2021) address the importance of project identity, which consists of the goals, values and norms of the project. The fifth dynamic in the list emphasizes on the demand of the certain expertise required in circular construction projects and the new roles in project teams this creates. As circular construction is relatively new, existing members take upon these roles, which should first be renegotiated in the project. An important role that can be assigned is that of the pioneer leader. Kooter et al. (2021) suggest that in every project a project

member should have the responsibility to put and keep circularity on the agenda. At last, members in project teams can learn from each other by continuity in staffing between projects and organizations (Kooter et al., 2021).

The third cluster are the contextual influences, that need to be taken into account when realizing the circular ambitions. The first contextual influence that is recognized is the culture that lives on national, organizational and project level. The culture can influence the values, norms, rituals and practices of the members. As mentioned for circular construction projects, certain knowledge is still lacking. As different members can have different knowledge or the lack of it, the knowledge flows in project is considered as the second contextual influence. The last contextual influence is power distribution and the tension between organizations. Power can be seen in the dominance of clients, which usually have a temporal perspective on projects, i.e. budget (Kooter et al., 2021). Tension can arise, when organization see each other as rivals or if there is distrust between them.

2.3 Learning theory and concepts

For the transition of knowledge theories and concepts about learning are examined. Brown et al. (2003) describes two types of learning, first order- and higher order learning. First order learning provides insights on problems and higher order learning can, in addition to this, change problem definitions, norms, values, convictions and goals of members. To transition traditional processes into circular processes, the latter can be used for radical solutions and change (Leising et al., 2018).

Learning processes can be conceptualized in two learning loops. They illustrate how members can learn in circular building projects and how this translates to their context. The first loop is single loop learning, which is similar to the first order learning from Brown et al. (2003); (Leising et al., 2018). It identifies the problem in its context, correct actions, but does not reflect on it on a higher level. Argyris (1977) used an example of a manager that detected a problem and solved this with product X. Double loop learning is a type of higher order learning, as it is able to alter organizational policies, norms and objectives. It reflects on the problem and correction to lead to insights about the problem and how to solve it (Argyris & Schon, 1974). Using the example of the manager, in double loop learning, the manager could question him- or herself if product X should be manufactured to prevent any additional problems (Argyris, 1977).

During the learning process, there are three mechanisms present. The first is deepening, which is gathering the knowledge. The second mechanism is broadening, in which this knowledge is tested in different contexts. At last is scaling up, which refers to using the knowledge for integration in processes or policies. It is as an approach that uses findings from experimentation to move sustainable practices

into the mainstream practice and for integration in processes or policies (van den Bosch & Rotmans, 2008).

Crossan et al. (1999) found that learning can happen on different levels, namely individual level, group level and organizational level. When individuals learn, they do this by intuition and interpretation of certain events or conversations. Learning on group level occurs when what is learned is also integrated in the work processes of the group, which means that actions to solve the problem are acquired. Learning on organizational level influences the institutional level, which means that these actions are also translated in policies or procedures (Crossan et al., 1999)

Then the concept of triple loop learning, which can be seen as a 'meta' to the single loop and/or double loop learning processes. It is not an incremental of the previous loops (Tosey et al., 2012). But it relates to the ability to learn. Argyris and Schon (1974) call this deuteron-learning, which is translated as 'learn-how-to-learn'. Triple loop learning results in learning strategies or structures (Romme & Van Witteloostuijn, 1999).

In chapter one, project based learning is introduced as the learning strategy for the tool. Liu (2021) emphasizes that this is a promising method to use when transitioning knowledge between construction projects. This is because finished projects provide opportunities to learn lessons from and obtain knowledge to solve problems on current or future projects. However, the uniqueness of the project makes it difficult to diffuse between projects and stages of the project. For successful project based learning, Liu (2021) emphasizes on five principles. The first is owner commitment, which means that motivation, engagement and participant is required of the project owner. Secondly, Liu (2021) mentions the social environment approach, which calls for the motivation and engagement of the team members within projects, facilitating the social interaction. Then the collaboration vision is addressed, which corresponds to the quality of the team members and their ability to work together to achieve the learning objective (Liu, 2021). As fourth principle the value orientation is explained, which is the approach of a more strategic role for learning in the project setting. At last, Liu (2021) calls for the open mindset of the project participants, which enables them to think more outside the box on the design and implementation of the project. Due to the synergy of the principles, they should be implemented alongside one and another (Liu, 2021).

3 Research Methodology

The first section is dedicated to the literature on design science research and in the section that follows the research design is presented. Then the chapter explains the development of the initial tool V0. To explain the approach on how the following versions came to be, the last sections present the approach on data collection and -analysis.

3.1 Design science research

Hevner et al. (2004) provides guidelines for design-science research, see figure 5. A good design research takes all into consideration, which is the strive for this research as well. In 2007, Hevner (2007) published another article on design science research. This time he showed the relation between the environment and design science research (relevance cycle) and the relation between design science research and knowledge base (Rigor cycle). These cycles illustrate that the design process, is interrelated with the field, the research and literature, see figure 6. The principle of evaluating the design during the design process, is what Sein et al. (2011) calls action design research, which is a derivative of traditional design research.

Guideline	Description
Guideline 1: Design as an Artifact	Design-science research must produce a viable artifact in the form of a construct, a model, a method, or an instantiation.
Guideline 2: Problem Relevance	The objective of design-science research is to develop technology-based solutions to important and relevant business problems.
Guideline 3: Design Evaluation	The utility, quality, and efficacy of a design artifact must be rigorously demonstrated via well-executed evaluation methods.
Guideline 4: Research Contributions	Effective design-science research must provide clear and verifiable contributions in the areas of the design artifact, design foundations, and/or design methodologies.
Guideline 5: Research Rigor	Design-science research relies upon the application of rigorous methods in both the construction and evaluation of the design artifact.
Guideline 6: Design as a Search Process	The search for an effective artifact requires utilizing available means to reach desired ends while satisfying laws in the problem environment.
Guideline 7: Communication of Research	Design-science research must be presented effectively both to technology-oriented as well as management-oriented audiences.

Figure 5: Design-Science research guidelines (Hevner et al., 2004, p. 83)
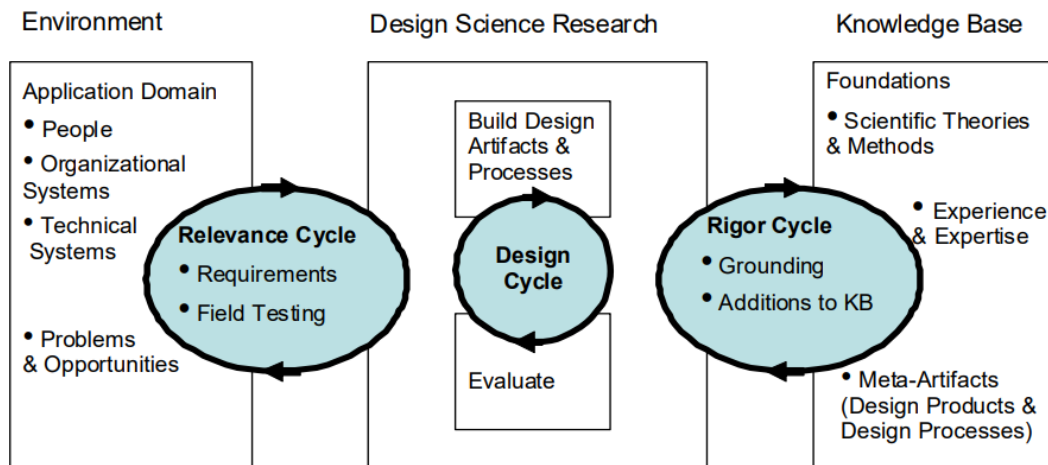
Figure 6: Design Science Research Cycles (Hevner, 2007, p. 2)

Another view on design-science research is the mental model of Peffers et al. (2007), see figure 7. This model is called the Design Science Research Methodology (DSRM) and illustrates the design science in a more chronological manner compared to the three cycle model from Hevner (2007). It shows the steps to be taken in a design process more clearly, as well as when to evaluate. The advantage of the DSRM model is that it is developed for design processes that are substantiated with prior knowledge (Peffers et al., 2007).
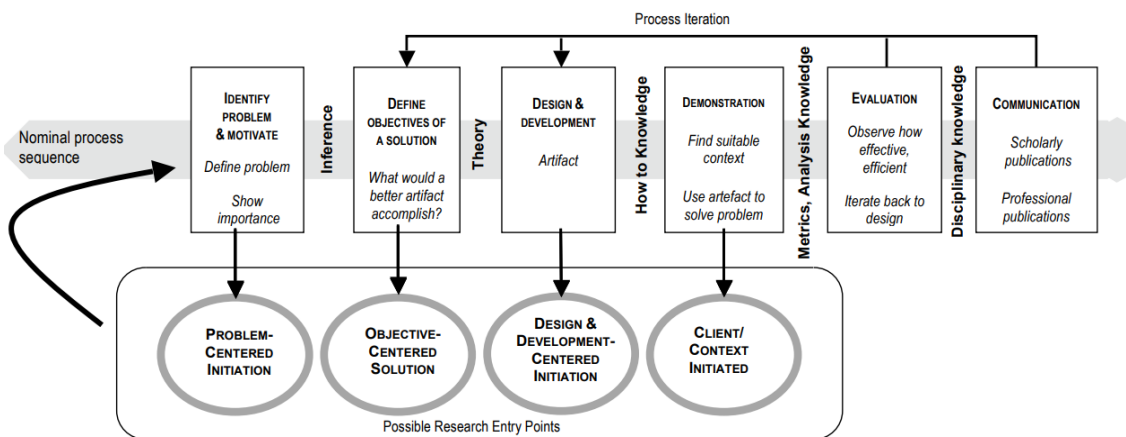
Figure 7: Design Science Research Methodology (DSRM) (Peffers et al., 2007, p. 2)

3.2 The research design

Literature on design science is assumed to provide sufficient insight to select a research design to develop the evaluation tool further. In previous section, two concepts were given, one from Hevner (2007) and the other from Peffers et al. (2007). Both methods provide other benefits, the relations

(three cycle model) and the process (DSRM). Therefore the design that is used for this research is a combination of the two.

In figure 8, the research design is illustrated and can be read from top to bottom, starting at identifying the problem and finishing with communication. From left to right the research design is split into three columns, environment, design science research and knowledge base, which are derived from Hevner (2007). The oval shaped text boxes between the columns, show the relation between the columns and explain the switch between columns. They represent the relevance- and rigor cycle (Hevner, 2007). The process of this research is mostly based on the steps provided by Peffers et al. (2007), such as identify problem and objectives of the solution, find suitable context for demonstration, the moment of evaluation and iteration of process and communication (Peffers et al., 2007). Only the iteration back to identifying objective of solution is left out, as this is not feasible to do in the time frame of this research. Elements such as research question, literature review, case selection and conclusion are added independently as these are considered crucial for the process of this research. In addition the recruitment of participant for the focus group and interviews are added as this in an important part for this particular method (Powell & Single, 1996)
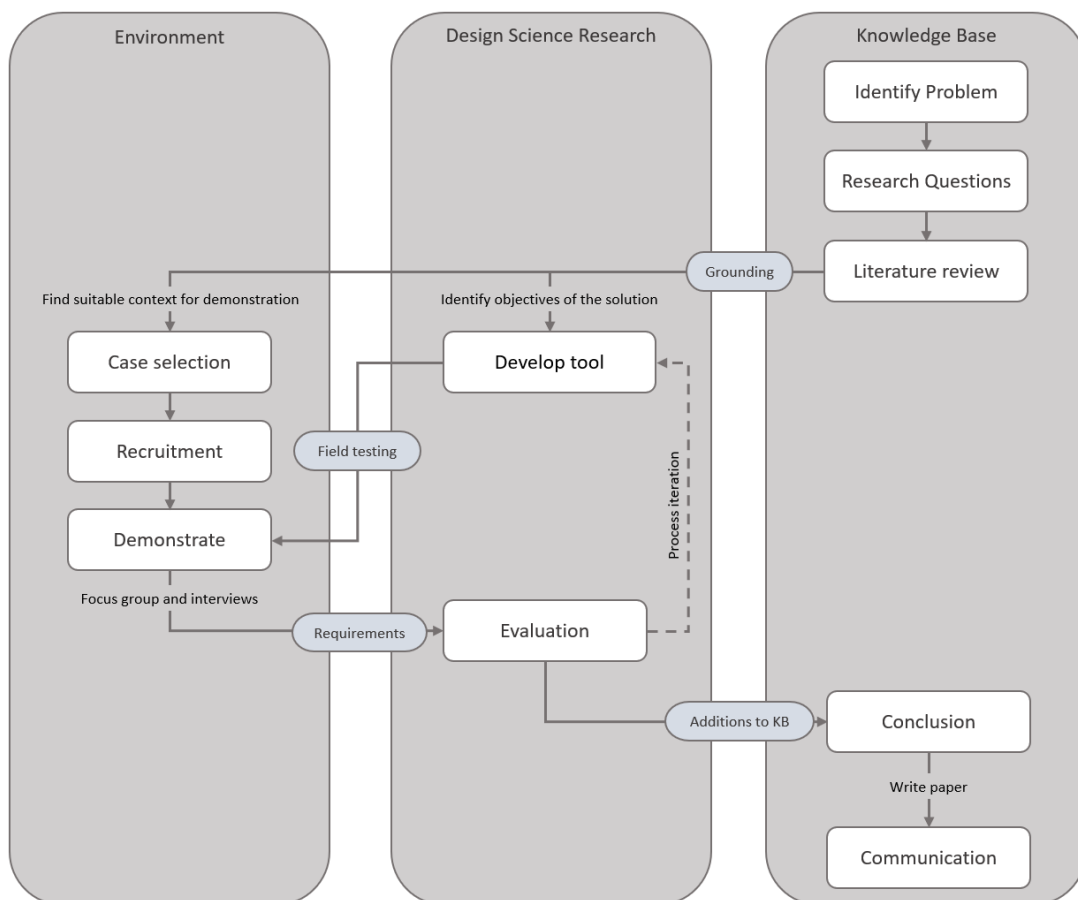
Figure 8: Research Design (own figure)

3.3 The development of the initial evaluation tool

The first tool that is field tested is the tool V0, see also appendix. As described this tool is based on literature presented in chapter two. In the introduction criteria were given for the tool and are summarized below.

The evaluation tool must be easy to use and accessible for project teams;

1. Consolidation of project dynamics on a single artifact
2. The tool can be printed on paper
3. Is developed on an A3 format.

In addition the tool must provide;

4. immediate use after the completion of this research

For the initial tool the project dynamics are derived from literature. The tool should provide valuable lessons on the dynamics necessary to stimulate the realization of circular ambitions in construction projects. Kooter et al. (2021) describe seven dynamics, which are explained in chapter two. Not all of these dynamics are considered essential for the tool. Leising et al. (2018) emphasizes on bringing partners together within the network of the supply chain, which requires trust between the supply chain partners (Leising et al., 2018). Therefore trust and transparency is assumed the first essential dynamics. Moreover, Leising et al. (2018) elaborates on this trust, and mentions that is can be created through providing certainty for upcoming assignment, pro-actively engaging on new expertise for support and openly discussing the process, instead of only the product (Leising et al., 2018). The first means is considered not in the scope of this research, as it focuses too much on the supply chain and therefore not applicable as essential dynamic for the tool. The last two can be used as substantiation to select the struggle for new roles and flexibility as the second and third essential dynamic next to trust and transparency.

Then, for the tool to be able to fulfill the aim of this research it is important to consider the learning theories and concepts. It is assumed that to reach the aim for this research, the tool should enable a higher order learning. This is because it provides the opportunity to change problem definitions, norms, values, convictions and goals of members (Brown et al., 2003). That higher order learning is essential is also concluded by Leising et al. (2018), who in addition states that 'actors need to learn to broaden their scope to include end-of-life options for a building' (Leising et al., 2018, p. 22). This means that the tool must provide the opportunity for members to gain insights in the integration of circular project dynamics and where it is lacking in the project currently, but also explain why this is essential to integrate in the project process. Therefore the learning mechanisms are taken into consideration.

The focus of the tool is on the mechanism of deepening, which enables members to gather knowledge on circular project dynamics while identifying problems in their current project and reflect on this. However, the tool stimulates to formulate new actions for the project team to integrate in group processes and transition them to other projects, which is considered broadening. Then, it also possible to scale up lessons to alter policies and company procedures. Based on this, a conceptual framework is made, see figure 9. It is assumed that the elements in the triangles of the framework can be interpreted either as a single- or double loop learning process. Below examples are given of how the single- and double loop learning could affect the learning process of the members in the team. The implementation and validation of the learning processes are not the focus of this research as it can be an independent research in itself. However, these concepts should be considered while developing the tool V0 and for further developments.

For the element on the bottom, about identifying problems, the single loop learning process could result in identification of the problem, being the lack of a project dynamic in the project or insufficient integration. The double loop learning process, could investigate this problem, looking for underlaying conditions that influence the current state and why it is not present or integrated insufficient. Then, see if this reasoning is applicable for other problems as well and questioning if the problem can be solved by solving other problems first. For the second element, about reflecting on the impact of the problem, the single loop learning could reflect on the impact of this problem on the project and see if it is important for the specific project. The double loop learning, could then investigate if this impact could influence other projects as well and why it is therefore important to integrate in project processes. For the third elements, about formulating actions, the single loop learning could simply, propose a solution for the problem identified. The double loop learning could then reflect on this solution to see if it applicable for other problems and to prevent the problem from happening in future projects. For the fourth element, about integrating this action, the single loop learning could simply be to integrate the solution to solve the problem. The double loop learning could reflect on the integration of the solution, investigate the effects and see if it can be used to prevent other problems and also in other projects. For the element on the top, about using the using knowledge to alter policies and company procedures, the single loop learning could change the procedure or policy to fundamentally solve the problem and change the way the company operates. The double loop learning could think on how other procedures and policies can be altered to facilitate the new procedures and policies in a way that the transition can be even more efficient.

Actions stimulated by the tool

Using the knowledge to alter policies and company procedures

Integrate in new group process and/or transition new knowledge to other projects

Formulate actions and lessons to solve the problem

Scaling up

Broadening

Reflect on the impact of the problems

Deepening

Identify problems using the evaluation tool, the insights in circular project dynamics and the checklist

Focus of the tool and part of the research

Figure 9: Conceptual framework (own figure)

The learning strategy that is investigated to use in the tool is project based learning, derived from Liu (2021). The reason for this strategy is that Gronheid (2021) mentions that learning on organizational level is important for the transition towards a CE. Liu (2021) states that the strategy of project based learning enables learning on this level, as it transitions knowledge between construction projects and provides opportunities to learn lessons from and obtain knowledge to solve problems on current or future projects (Liu, 2021). Derived from this, the tool is developed so that team members can reflect on the project they are currently working on, gain insights and learn about the integration of circular construction project, with the expectation to transition the insights between other projects as well.

3.4 Research cases

The selection of the cases are based on the prerequisites, explained by Kooter et al. (2021), see also figure 4. In 2.2 a part is dedicated to explain these prerequisites. The criteria of the cases were to have at least three of the four prerequisites and to have at least all prerequisites represented once when all cases combined, see table 1. By doing this, it can be assumed that the data provided by these project teams combined would represent a substantiated circular project. The criteria were tested with an informal initial interview. In the following sections the cases are introduced.

	Top-down support	Partnership based upon increased equality	Shared circular goals	Involvement of intrinsically motivated people
Ipse de Bruggen (IdB)	+	+	+/-	+/-
Circular City House (CCH)	+	+	+	+
Sporthal Bredius (SB)	+	+	+/-	+

- insufficient   x/- sufficient   + good

Table 1: Selection criteria for cases (own table)

Case: Ipse de Bruggen Vlaardingen

Figure 10: Residential care facility for Ipse de Bruggen in Vlaardingen (Bureau Bos, 2021)

One case for this research is a residential care facility in Vlaardingen, South Holland. It is a living community with 40 clients that require additional attention for their daily activities. The organization Ipse de Bruggen desired a new care facility that fulfilled the need for more individual care opportunities, which enables them to offer their clients their own place in the society. The project had high sustainable ambitions. This is translated in the floors which are easy transferable to other functions and the whole building being almost energy neutral. Interesting is the facade, which is due to a dry stacking method (fixbrick) completely demountable (Bureau Bos, 2021).

Case: Circular City House Amsterdam

Figure 11: Circular City House in Amsterdam (Space & Matter, 2022)

Another case is provided by Space & Matter and is called the Circular City House. It is located in Amsterdam at the former café De Omval. The plan was originally called Spectrum and is organized by the Municipality of Amsterdam. The multifunctional building is composed entirely out of wood and is wrapped around the cafe De Omval. With this, the buildings honors the rich history of the location, while providing a new future for it as well. The wooden framework provides the Circular City House to have an open floorplan. Therefore it can be altered in function, depending on the preference of its user (Space & Matter, 2022).

Case: Sporthal Bredius Muiden

Figure 12: Circulaire Sporthal Bredius (Lichtstad Architecten, 2022)

The third case that is used in this research is the Circulaire Sporthal Bredius, located in Muiden. It is a contrasting design, compared to its environment and represents the sporting experience and social

interaction. It does this by adding the structure of columns to create a high and open meeting place under the canopy. The main steel construction is completely demountable and the material use is limited to a minimum and also reusable after the lifecycle of the building. Interior building materials, such as walls and the sports floor, are made of recycled material. Furthermore, the building has an energy neutral design and the installation provide the opportunity to manage and use waste products (Lichstad Architecten, 2022).

3.5 Data collection

As shown in figure 8, the demonstration of the tool is conducted via focus groups and interviews. A focus group is an group of selected participants that discuss a topic of focus, which is prepared by the researcher (Powell & Single, 1996). The method is commonly used in social science, such as in researches used by marketers, policy analysis and political consultants. This is because it can be used to generate general knowledge on certain topics, diagnosing potential problems in services or products and stimulate the growth of new innovations and ideas (Stewart & Shamdasani, 1990). Benefits for this research are traits that enable additional data for validation or a specific focus on certain variables within the tool (Powell & Single, 1996).

Critical for a focus group is the group recruitment (Stewart & Shamdasani, 1990). The recruitment is important as this has a direct influence on the group dynamics, which then influences the behavior of people and can alter data (Stewart & Shamdasani, 1990). The recruitment of the group for this research is based on the cases selected for this research. For each case the responsible project team is used, consisting of architects, engineers, developers, client, advisers etc. It is believed that heterogeneity within group composition is more effective than homogeneity (Stewart & Shamdasani, 1990). For this research the difference in expertise should provide interesting heterogeneity.

For each case two focus group sessions are planned. The first session is more explorative and aims on gathering new project dynamics to integrate in the tool. To facilitate a discussion and to come up with new dynamics, inspiration is taken from the nominal group method, explained by Powell and Single (1996). In this research it is used in the following manner: After a short explanation about the selected dynamics, which are flexibility, struggle for new roles and trust and transparency. Each member writes down what they think are important project dynamics for each of them. Then these are discussed within the group and the group has to rate them in order of important, influential and/or relevance. In this sessions the focus is on sub questions 1 and 2. The first session is also interesting as it can be used to generate trust between the researcher and the project team and to get acquainted with the tool.

In the second session the tool is used by the project team to evaluate the case that they are responsible for. In this session an even more passive role is required from the researcher. The project team is again able to provide new project dynamics for the tool. But in addition the researcher is able to observe how the project team uses the tool and derive data to develop the tool in a way that makes it more usable and understandable. In this session time is reserved to conclude with the project team the usability of the tool and therefore focusing more on sub question 3. Questions are asked for example on when in the process they would integrate the tool or if they would use it once or more times during the project.

For the final version of the tool, VFinal, a focus group is planned with experts in circular construction, namely with a project leader for construction projects and a board member of architectural firm. They were recruited based on the criteria that they were themselves part of a project team and have experience with working on circular projects. Because this was the last session, it is prepared around all three sub question. All focus group session, therefore also the ones explained above, have an equal approach as selected for interviews, which includes the semi-structured guide and an inductive approach.

When during a focus group session specific interest emerged in a perspective of a member, topic discussed or a project dynamic, in-depth interviews were planned. Through the integration of in-depth interviews, it is able to obtain deeper understanding of certain requirements and insights of members and how they perceive the social situation (Gorden, 1956). A semi-structured interview guide is selected to provide respondents the freedom to discuss areas not addressed by the researcher and therefore enable a more open-ended environment (Powell & Single, 1996). This is also achieved with an unstructured interview, however as these interviews are used to gain insights in specific interest raised during focus groups, some guidance or structure is desirable. This method is supported with an inductive approach, which involves little or no predetermined theory beforehand of the interview. The theory, or in this case deeper understanding on a project dynamic for example, derives from analyzing the data (Burnard et al., 2008). Below it is discussed with who and why additional interviews were held.

For the research three additional interviews are conducted concurrently to the focus group sessions, see figure 13. The first interview was conducted with a client of case Ipse de Bruggen. The reason for this interview was the notion of a circular business case in the first session of case Circular City House. When this project dynamic was integrated in V2 and discussed, the interest emerged on the perspective of the client on this manner, which was not present at the second session of case Ipse de Bruggen. The second interview was to discuss relation between dynamics and cocreate a new structure

of the tool for V3. This interview was held with the architect of case Ipse de Bruggen, who mentioned this during the second session of this case. The third interview is conducted with the circular consultant that instructed the project team of case Circular City House about circular business models. This interview was conducted to gain insights in the experience they have with the built environment and the use of evaluation tools to consult project teams. In addition, it was used to obtain any improvement for the tool from a consulting perspective. To ensure privacy and safe collaboration an informed consent is verbally shared during each session or interview, see also appendix.

After each session the tool is developed further. The proposed tool is called V0, the tool after session 1 is called V1 and so forth, see appendix for each version of the tool (in dutch). The sessions are planned to enable an analytical generalization, described by Yin (2013). This is done by planning the sessions in a cross-case reference, with the aim to generate a framework of findings that is applicable to a broader range of construction project in the built environment. With this the generalization of findings can be presented as a theory instead of a set of isolated concepts (Yin, 2013). Yin (2013) emphasized on this as desired for analytical generalization as this yields better understanding of the research outcomes (Yin, 2013). In practice this also meant that questions or insights raised during the session of a particular case could immediately be validated to another case and back, see figure 13.
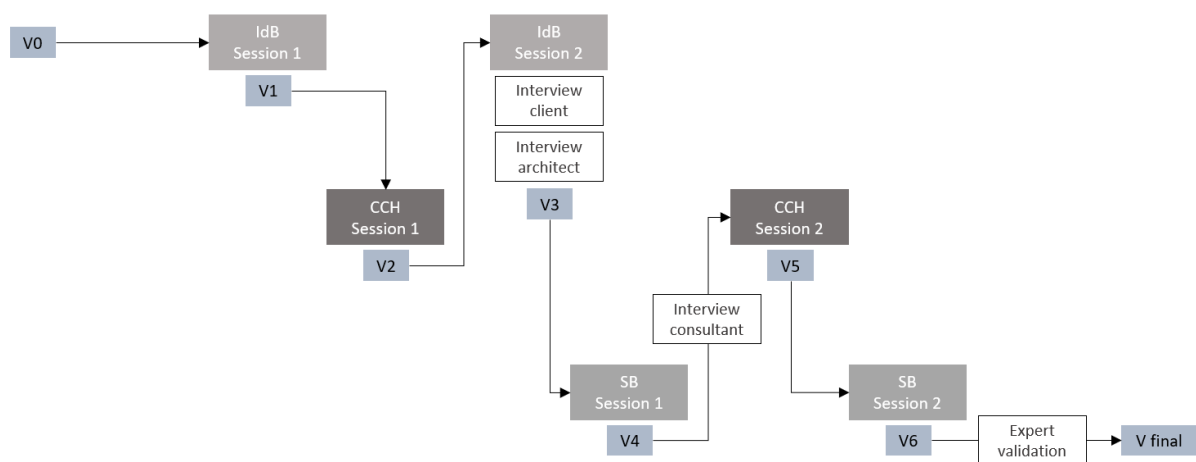
Figure 13: Session structure and development of the tool (own figure)

The organization of the focus group is derived from Powell and Single (1996) and Stewart and Shamdasani (1990) and altered to fit this research. The aim was to have 6-12 participant each session, to schedule at least an hour for every focus group and to inform the participants about the appointment at least 10-14 day before. The focus group was led by the researcher, who should have a relaxed appearance and facilitate an open conversation. The sessions are audio recorded to be able to re-listen the session later for analyzation. However it is made sure that the equipment present during the sessions did not interfere with the interaction. This is accomplished by using a recording device

that could lay on single place during the whole session. See the appendix for the scripts of session 1 and 2 (in dutch).

3.6 Data analysis

To analyze each session a report is written on what is discussed so that it can be read and validated by other researchers (Stewart & Shamdasani, 1990). Reports of all session can be found in the appendix. For this research the two stage method of Powell and Single (1996) is used with the integration of the cut-and-paste technique explained by Stewart and Shamdasani (1990) in the first stage.

First stage

After the report is written based on notes and the recordings, the data is classified in the categories flexibility, struggle for new roles, trust and transparency and general. The first three categories are chosen because they are the dynamics that are chosen for the evaluation tool, used to answer sub question 1 and 2. The category 'general' was made for findings not relevant to the tool and for findings that were about the structure of the tool, used to answer sub question 3. The classification is done using the cut-and-paste technique. In this method the data is analyzed and tagged to which category is belongs. After this, all tagged dynamics are cut from all the gathered data and paste together along with other dynamics in the same category. The overview of project dynamics was used to see overlaps, contradictions and interesting new insights.

Second stage

In the second stage the comparison is made with sessions with the other project teams. Powell and Single (1996) explain that this can show if there are differentiating views (Powell & Single, 1996). Decisions made during the development can be validated. The second stage has this opportunity as data can be compared to see if the findings are not just for a particular project team, but if this also accounts for the other cases. This also provides the opportunity to observe if the criteria provided in section 3.3, still hold.

4. Findings

During the development project dynamics were added, with the section of 'define the field' as biggest addition. Deletion of dynamics did not directly happen, because during the development dynamics could often be combined into more generic project dynamics, providing a more flexible interpretation. It also occurred that dynamics were improved because of uncertainties addressed by participants or to solve contradictions. The structure of the tools provided the biggest alteration in the usability of the tool, going from a single road map towards a two-sided tool with on the left side an evaluation of the

preparation of the project and on the right side an evaluation for during process. In this chapter the developments are explained for each version of the tool (V1-VFinal) by answering the sub questions provided in the first chapter. In the reference of the cases in the text, the section is provided in which the statements can be found in the appendix. In the end, the development are made visual in figure 14, 15 and 16.

Development of tool V1

The substantiation of this version is the first session of the case Ipse de Bruggen, referred to as IdB.1.

1 Which project dynamics are useful for integration in the tool and what can be deleted from the tool?

It is found that for flexibility the possibility of a longer preparation, derived by Kooter et al. (2021), is due to the project team requiring more time to de research on circular opportunities (IdB.1, section 1). It is explained that the assessment on circular opportunities provide the project team to discuss circular ambitions beforehand. The determination of these ambitions in this phase of the project provides a strong foundation for the following phases of the project (IdB.1, section 2). The tool should provide the additional checkpoints to explain the possibility of a longer preparation phase. Kooter et al. (2021) mentions that the budget for a project, should be able to be flexible allocated. In IdB.1 (section 2), it was discussed that the budget should have a fixed and separate budget to ensure the feasibility of circular ambitions (IdB.1, section 2). For the tool, it is assumed that these are two different means for the management of budget. Therefore, for V1, both are integrated and further sessions should provide validation. During the design process, flexibility could be implemented by thinking in variants, which means that the project is designed in a way so that multiple materials or solutions are feasible within the project. For this a flexible statement of requirement could provide the required room to maneuver. In addition, the design should enable flexible floor planning in the using phase of the building, and through this flexible installation zoning (IdB.1, section 2). For the tool, the project dynamics discussed above are integrated in the tool.

Kooter et al. (2021) explains a change in responsibility and presence of members in phases of the project, for example the contractor working more as architect or the integration of the demolition firm in the preparation phase (Kooter et al., 2021). Within the case project team, additional shifts are experienced. In case IdB.1 (section 2) it is found that the architect of the project team looks for the use of reusable materials and the inventarization of circular opportunity is seen as a group effort, in which every member should take responsibility (IdB.1, section 2). The struggle for new roles, addressed by Kooter et al. (2021), provided the suggestion of integrating several additional experts to the project team, namely a circular installation advisor, expert on the circular material market, expert in circular building and an overall circularity advisor. Also it is beneficial to have a circular specialist within

organization, who knows the company culture and is easy accessible (IdB.1, section 3). For the development of V1, these project dynamics were added to the tool, as later sessions should validate these insights.

It is derived from the findings of Kooter et al. (2021), that members of the project team should be more open to share feelings on risk and the progress of the project (Kooter et al., 2021). To this notion it can be added that the open environment enables more insights in the budgeting of the project, to create a transparent environment on what is still possible and what not in respects of circular ambitions and to where the budget is allocated. Also, in addition to risk and progress, circularity should specifically be discussed more openly in order to keep each other accountable for protecting the circular ambitions. In IdB.1 (section 1), this turned out to be a challenge, because 'the client has given us [project team] an ambition, but in the end it was not protected.' (Architect Director, IdB.1, section 1). Therefore, it is recommended to facilitate planned moments to discuss circularity. This could be a meeting entirely dedicated to circularity, explained in an example of Kooter et al. (2021), but also simply adding it to the agenda of a meeting. The modeler of IdB, had experience with daily meetings for 15 minutes, starting the day. It was mentioned that 'in the beginning I [modeler] thought it was too much of a hassle… …but eventually we did become a team where you could easily ventilate all concerns.' (Modeler, IdB.1, section 4). To see how ambitions are implemented in the project, during the phases, the progress should also tracked in documentation, for example in phase documents. The documentation about the progress of circularity in the project could also be an important way of generating trust and communicating to the client and other stakeholders. Substantiating decision and presenting progress can create an image that the project team is well able to realize the ambitions, is resilient to risks and willing to go the extra mile to reach the circular ambitions (IdB.1, section 4). For the development of the tool these project dynamics were added, to see if these findings correspond with the other cases in later discussions.

2 How could the interpretation of the project dynamics in the tool be improved to better represent the available findings?

The dynamics derived from Kooter et al. (2021) and integrated in the tool showed no contradiction with the dynamics provided in case IdB.1. It did provide further explanation and examples of some project dynamics, as discussed above. Further sessions should clarify if the dynamics added are generic or project specific.

3 How could the content of the tool be presented more clearly for the user of the tool?

In V1, many new project dynamics were added to the explanation boxes and checklists. The structure of the tool is therefore made more clear by creating a left to right distinction of main project dynamics (left), explanation (middle) and checklist (right), which was a bit unclear in V0.

Development of tool V2

The substantiation of this version is the first session of the case Circular City House, referred to as CCH.1.

1 Which project dynamics are useful for integration in the tool and what can be deleted from the tool?

The discussion on budget, that raised during the development of V1, was explained in CCH.1. It was found that this discussion is not about the management of budget per se, but more on the total business case of the project. The business case provides answers to how cashflows are managed in the project, under what conditions partnerships are arranged and in the end, how the project is made financially feasible (CCH.1, section 1). For the tool, this meant that the project dynamics on budgeting were deleted and replaced with 'create a circular business case'. As mentioned, for the circular business case new requirements and conditions for partnerships should be developed (CCH.1, section 1). This is also explained by Kooter et al. (2021) and was part of V1 as well. It was explained that an important requirement is commitment, which is, unfortunately hard to measure, according to the participant in CCH.1 (section 3). The project team should find ways to measure commitment, for example by selecting partners on their experience with circular projects (CCH.1, section 3). The commitment is important as circular business models often require the suppliers and manufacturers in project to become co-owner or co-invest in a project. And in addition, it is still uncertain if the implementations and innovations of today are still relevant in the future, this also includes the residual value of product. It is stated that 'the real commercial application [of the circular business model], has still some issues to be solved'. (Senior developer, CCH.1, section 4). Finding commitment partners is therefore added in the tool in the checklist. Commitment can also be stimulated as 'you have to trigger the supplier to deliver highest quality possible' (Senior developer, CCH.1, section 2). For this to work effectively it is important that during the collaboration everyone is able to learn more about circularity. Therefore it is important to create an equal flow in knowledge and availability of information (CCH.1, section 3). For the development of the tool this dynamic is added to the part of trust and transparency.

2 How could the interpretation of the project dynamics in the tool be improved to better represent the available findings?

Just as the dynamics of budgeting, which were combined to 'create a circular business case', other project dynamics are assumed too specific for the tool to be flexible in a way that enables project team

to specify and add specific tasks and requirements themselves. In other words, the dynamics should provide the opportunity to discuss ambitions and be flexible on the implementation of it.

The dynamics about what expertise is required and who does what are deleted and combined as 'think beforehand which expertise is required'. The same is the case for the suggestions of all new responsibilities. These are deleted and combined to 'define each other's responsibility and expectations and communicate this with the team'.

3 How could the content of the tool be presented more clearly for the user of the tool?

As criteria 1 describes the tool should aim to fit on a single artifact. Combining specific dynamic into a single, more generic, project dynamic during the development of V2, helped to fulfil this criteria. Further development consisted of rewriting the dynamics in the checklist, so that it could be answered with yes and no. Also the sequence is rearranged to follow the structure of the explanation boxes on the left.

Development of tool V3

The substantiation of this version is the second session of the case Ipse de Bruggen, referred to as IdB.2 the interview with a client, referred to as Interview client and interview with an architect, referred to as Interview architect.

1 Which project dynamics are useful for integration in the tool and what can be deleted from the tool?

For the development of V3, little content was found to be integrated in the tool. The only project dynamic that is added is that partnerships should be based on early integration and long term benefit (IdB.2, section 3). This is added as part of the preparation.

2 How could the interpretation of the project dynamics in the tool be improved to better represent the available findings?

In the session of case IdB.2 the dynamic of 'creating a circular business case' was discussed. Among team members it was not clear what is meant with a circular business case and that it is possible that this was present, but that they did not know it as they see this as a responsibility for the client (IdB.2, section 2). The question is raised during the interview with the client, providing answers on the concerns of implementing a circular business case. It is mentioned that writing a circular business case is more difficult than is assumed in general. This is because it is uncertain who is willing to take the risk on building materials in the future, because is difficult to predict the future value. But even if such partner is found (see committed partner CCH.1) new challenges rise with accounting the residual value on the financial balance as this can cause problems in the solvability of a company. This requires a lot

of trust and transparency in the financial markets, but it is not clear if the current economy is ready for this (Interview client, section 3). The client continues by saying that if the government wants to stimulate circularity, it should change its norms and requirements and provide additional budgeting (Interview client, section 1). In the development of the tool the use of a circular business case is not deleted, trusting that the use of it can be beneficial for the transition towards CE. However, a more critical view is required on this manner for the following sessions to determine how this should be integrated in the tool.

In IdB.2 (section 2) it is mentioned that it is important that all members have equal ambitions. However it is not yet clear to where this could be integrated within the tool. The question was also raised in the interview with the client, who stated that a client's initial focus is reaching sustainable norms, because that is where the budget is reserved for. If there is budget left or additional budget is reserved, more progressive ambitions can be discussed, such as circularity (Interview client, section 1). This could cause issues when project teams aim for determining circular beforehand, as the tool suggests. Therefore it is assumed that this dynamic requires further research before integration.

3 How could the content of the tool be presented more clearly for the user of the tool?

In the observation of case IdB.2 it is found that a clear relation between project dynamics is present. This means that one dynamic cannot go without the other or if one dynamic is fulfilled insufficient the other cannot be optimal either. This finding is also discussed and confirmed during the interview with the architect. In addition it is mentioned that 'when you go through the checklist I [architect] feel that a process is starting to form, […] your tool shows an approach to come up with a plan of action, and then you go into a circle of evaluation' (Interview architect, section 2). For example the dynamic of 'sharing responsibilities and expectations with members of the project team' was initially an project dynamic for the preparation. However it became clear in the interview with the client that this should be discussed during the whole project (Interview client, section 3). And therefore is seen as part of the evaluation of the process. Thus the structure of the tool is altered to have two sides, one as evaluation of the preparation and the other side to evaluate the process.

For the new lay-out several additional remarks are used. During case IdB.2 (section 5) it became clear that the tool should stimulate conversations. Or as the project leader of the case Ipse de Bruggen explained that 'we [project team] can improve on all elements, even if we [project team] have checked them. That is because you can look at the elements in a broader perspective' (Project leader, IdB, section 5). For the development of the tool this meant to integrate a scale of satisfaction, to provide nuancing answers to the evaluation points. This resulted in reformulating the questions into statements instead of yes and no questions. The nuances and different answers among team members

should stimulate conversation in the project team. In addition it became clear that the tool should be able to develop during a process, by suggesting follow-up questions and provide room to add specifications to evaluation or specific tasks to be evaluated again later. That is why it is stated that the tool can provide much more then only as evaluation tool, but also to formulate a plan of action (IdB.2, section 5; Interview architect, section 2).

Development of tool V4

The substantiation of this version is the first session of the case Sporthal Bredius, referred to as SB.1.

1 Which project dynamics are useful for integration in the tool and what can be deleted from the tool?

In case SB.1 the importance of having equal ambitions, mentioned in development V3, is discussed again. Having equal ambitions means that the personal ambitions should not negatively influence the circular ambitions that are determined as a group. This is formulated in this manner, as it became clear that having different views and interest is not wrong, because in the end, each member has its own interest in the project (SB.1, section 4). Therefore this is integrated in the tool this way as an evaluation point for during the process.

The tool suggests to make expectations and responsibility of team members transparent. In the case SB.1 several examples for this were discussed. At first that members of project teams should think from final construction to structural construction. This means that you 'use the quality of structural constriction' and by that execute the 'art of leaving out' (architect, SB.1, section 1). With this you can minimize material use. In traditional projects it is often the other way around (SB.1, section 1). Secondly the members of the project team should focus more on product thinking instead of function thinking during the design process. This provides that materials and elements of the building are focused on circularity that fit the requirements. The alternative would be to look for how to meet the requirements, and then think if the implementation can be circular, which can be limiting circular implementation (SB.1, section 2). At last, it is the responsibility for each member of the team to look outside their own expertise. This causes members to learn from and to assist each other (case SB.1, section 3).

Being transparent in general is considered difficult to measure as 'you only know what you know and you don't know what you don't know' (contractor, SB.1, section 4). On the contrary, it is argued that knowing everything is not always ideal, it is about dealing with what is necessary to know and what not (SB.1, section 4). This is a confirmation that the tool should not suggest that everything should be made transparent. For example, mentioned during SB.1 (section 4) is that having too much insight in

the financials can be mis-used, by only seeing the opportunities and benefits. This because in the end the contractor is responsible and bears all risks (SB.1, section 4).

Therefore the feeling of trust should be present among the project team. Members must trust each other in making the right decision based on their expertise and interest in the project. In addition, suppliers should open up more about their products, think of raw materials used, way of manufacturing and distribution. But also have more trust in the residual value of their product on the long-term. This would enable project teams to select and collaborate more easy and to stimulate looking for circular solutions to linear supply chains (SB.1, section 1). This could also stimulate or benefit the use of circular business cases discussed in previous developments. As became clear in SB.1 (section 3), using a circular business case is just a mean and not a goal in itself. The project should always be feasible as there still consists a balance between circular ambitions and exploitation of the project (SB.1, section 3).

2 How could the interpretation of the project dynamics in the tool be improved to better represent the available findings?

In the previous version the dynamic of having flexible requirements or norms was deleted as it was considered to be part of formulating the circular ambitions. However it is considered that the level of flexibility is measured by the flexibility of norms and requirements. The limits of flexibility is the functionality of the building and safety of the end-user (SB.1, section 2). Therefore it is integrated again in the tool as: 'Ambitions are determined beforehand, that provide the opportunity for flexible requirements'.

3 How could the content of the tool be presented more clearly for the user of the tool?

The difficulty of measuring the level of commitment and transparency is emphasized again. Therefore it is assumed that the scale of satisfaction is a good solution to provide this scalability to be able to make this somewhat objective. Further developments on the presentation and/or structure did not happen for the tool V4.

Development of tool V5

The substantiation of this version is the second session of the case Circular City House, referred to as CCH.2 and interview with a building consultant, referred to as Interview consultant.

1 Which project dynamics are useful for integration in the tool and what can be deleted from the tool?

The quality of a project can be split up into three elements: (technical) Content, Process and Financial (IPF: (Technische) inhoud, process en financieel). Normally, in projects the (technical) content is

sufficient, the process needs some improvements but is also sufficient, the most problems come from the financial part (Interview consultant, section 2). During CCH.2 (section 2) one of the reason is discussed, namely that in many circular business cases the owner of the building becomes technical owner and not financial owner. This makes it harder to find financing from banks (CCH.2, section 2). Not having a financing sorted is problematic, because 'a positive business case stays leading' (Senior developer, CCH.2, section 2). Or in other words a circular project should always have a positive traditional business case (CCH.2, section 2). In addition, the building consultant emphasized on that a circular business model is only a means for a CE and that it should not be the goal to have one (Interview consultant, section 3). Therefore the tool now suggest to do research in the implementation of a circular business case and to discuss if it is suitable for the project.

In CCH.2 (section 3) a whole new section for the evaluation of the preparation is discussed, which is called, define the playing field. This means that before the start of the project and selecting the members of the project team, the intended members should be asked if they are willing to work for a circular project, as it requires additional efforts (CCH.2, section 3). Equally to finding committed partner, discussed earlier, the members of the project team should also be committed. Also thoughts can be discussed on an initial time frame of the project, read deadlines of phases. But later, when a project team is formed and expectations and responsibilities are discussed, a detailed planning can be developed (CCH.2, section 3). These project dynamics are integrated in the tool in a new section in the beginning of the evaluation of the preparation.

2 How could the interpretation of the project dynamics in the tool be improved to better represent the available findings?

The word vulnerable was changed to 'more open', as was explained that vulnerable can be perceived as a weakness and that is not what is meant here. The dynamic of a 'collaborative work environment and no negative impact of personal interest' should be split in two different dynamics. This due to the possibility of having a different answer on both (case CCH.2, section 4).

The formulation of project dynamics is not sufficient if it is formulated in a negative manner, addressing what not to do. This is because this leaves the interpretation open of what should be done by the members. Therefore the project dynamics in the tool should be positively formulated, explaining what should be done. This is done with 'leadership with no monitoring' to 'leadership based on trust'. At last the project dynamic of contracting is considered as part of forming the team. The long term interest or early integration could be a requirements of this and is therefore left out of the tool.

3 How could the content of the tool be presented more clearly for the user of the tool?

It is explained by the building consultant that companies prefer tools with checklists, but that this can result in the checklist becoming a goal and not a means, which results in that when a checkpoint is reached, they forget about it (Interview consultant, section 5). Referring to criteria 4, this could be a risk for the tool, because this would mean that lessons learned are not scaled up to organizational level. To remedy this risk, the building consultant suggests that could be 'something to hold on to for the one managing the process' (Interview consultant, section 5).

Another suggestion is to add the scale of satisfaction to the evaluation of the preparation phase as well. As it is assumed that the evaluation on these dynamics can also differ among members and this would stimulate the conversation further (Interview consultant, section 5). The project dynamic of Inventorize opportunities is moved to the section 'define the playing field' as well, as it was mentioned in case CCH.2 (section 3) that this happens along with selecting suitable members of the initial project team.

At last, the building consultant warned that people need more guidance than you would expect, while using tools like this. Therefore the suggestion was to make it overly obvious how the tool should be used (Interview consultant, section 5). Because the criteria of the tool are to not have many individual parts, it is not preferred to provide an additional guide for the tool. Therefore the tool itself should explain itself enough. How this will be structured was not yet clear and is examined in following sessions.

Development of tool V6

The substantiation of this version is the second session of the case Sporthal Bredius, referred to as SB.2.

1 Which project dynamics are useful for integration in the tool and what can be deleted from the tool?

When 'defining the playing field', added in the previous development, the initiators are also able to define circularity for the project. This does not mean to determine ambitions, but simply what does circularity mean. Because having the same definition among team members could benefit further developments in the process (SB.2, section 7).

During case SB.2 it became clear that for a public tender it is not always easy to select the best and most skilled members on circularity. You have to work with the parties that registered for the tender. However internally within an organization you can select members most capable more easy (SB.2, section 2). The distinction between public and private project is not made within the tool. However, discussed during SB.2 (section 6) the flexibility in the tool should make it possible to use the evaluation

points for all types of projects, however the evaluation of the preparation part is too dependent on the character of the project. This is because, for example, a public project has multiple times when a new team is created (case SB.2, section 1). It is not sure how this distinction can be added to the tool or if this should be the aim.

In the end some useful thoughts on trust and transparency were discussed to explain how this dynamic can take form during the process. You can trust someone, but you will still need transparency on the work and progress. And someone who is trustworthy has no issues of being transparent. Being just transparent however, does not mean trustworthy. Transparency can also be used to cover yourself juridical from responsibilities. That said, trust and transparency must co-exist (SB.2, section 5).

2 How could the interpretation of the project dynamics in the tool be improved to better represent the available findings?

Matters on the flexible planning seemed debatable, because it was not clear what is meant with a flexible planning. In the end it is determined that flexibility in the interpretation of the planning is crucial, but strict deadlines are inevitable. Or as explained by the client, 'yes [..you have to use a flexible planning..], but between a certain time frame, because if you let the deadlines go, then we were still debating on the design and then nothing would have happened still' (Client, SB.2, section 4). This in the perspective that the full steel structure and stability of the building is already constructed at the moment of SB.2. The tool now suggest to have fixed deadlines, but that the interpretation should be flexible.

Also the use of flexible requirements is considered not clear. As this causes confusion, because you would think that the requirements must be concrete (case SB.2, section 4). This is rewritten with the idea that the requirements should be concrete, but that the fulfilment of them can be flexible. In the evaluation part, it is mentioned that the 'team members should be open to each other and that they must accept that no one is the expert is the beginning'. However, there are team members hired because they are the expert (SB.2, section 5). This is rewritten as to have team members to be more open to other expertise and to work together to reach the circular ambitions. Then the 'circular business case' is rewritten as 'business case that makes the circular ambitions feasible'. This is because it is no must to have a circular business case, but it should mentioned to be discussed as option (SB.2, section 7). Then again a positive approach was suggested for the dynamic of 'not feeling to monitor'. Project dynamics should provide what to do and not what not to do (SB.2, section 5). It is changed to 'leadership stimulates trust and transparency'.

3 How could the content of the tool be presented more clearly for the user of the tool?

The tool has been changed to be more clear on the left side (checkpoints) being as evaluation of the preparation and the right side as evaluation on the process. Also the checkpoints mention the evaluation points so that the project team can anticipate on the evaluation. This is important for the process because 'when you know what you want to evaluate in the end, you can select certain actions in the beginning' (Contractor, SB.1, section 6). This can also be an argument to use the tool as a template for a plan of action. Or in addition provide guidance for members of project teams who are doubting if they want develop a circular project and do not have the knowledge inhouse (SB.2, section 7).

V0 → V1

Increase of elements and the clear left to right structure

V1 → V2

Combining elements to create a more generic checklist and decrease the amount of elements

V2 → V3

Creating a new structure, evaluation for preparation and process separate and adds a scale of satisfaction
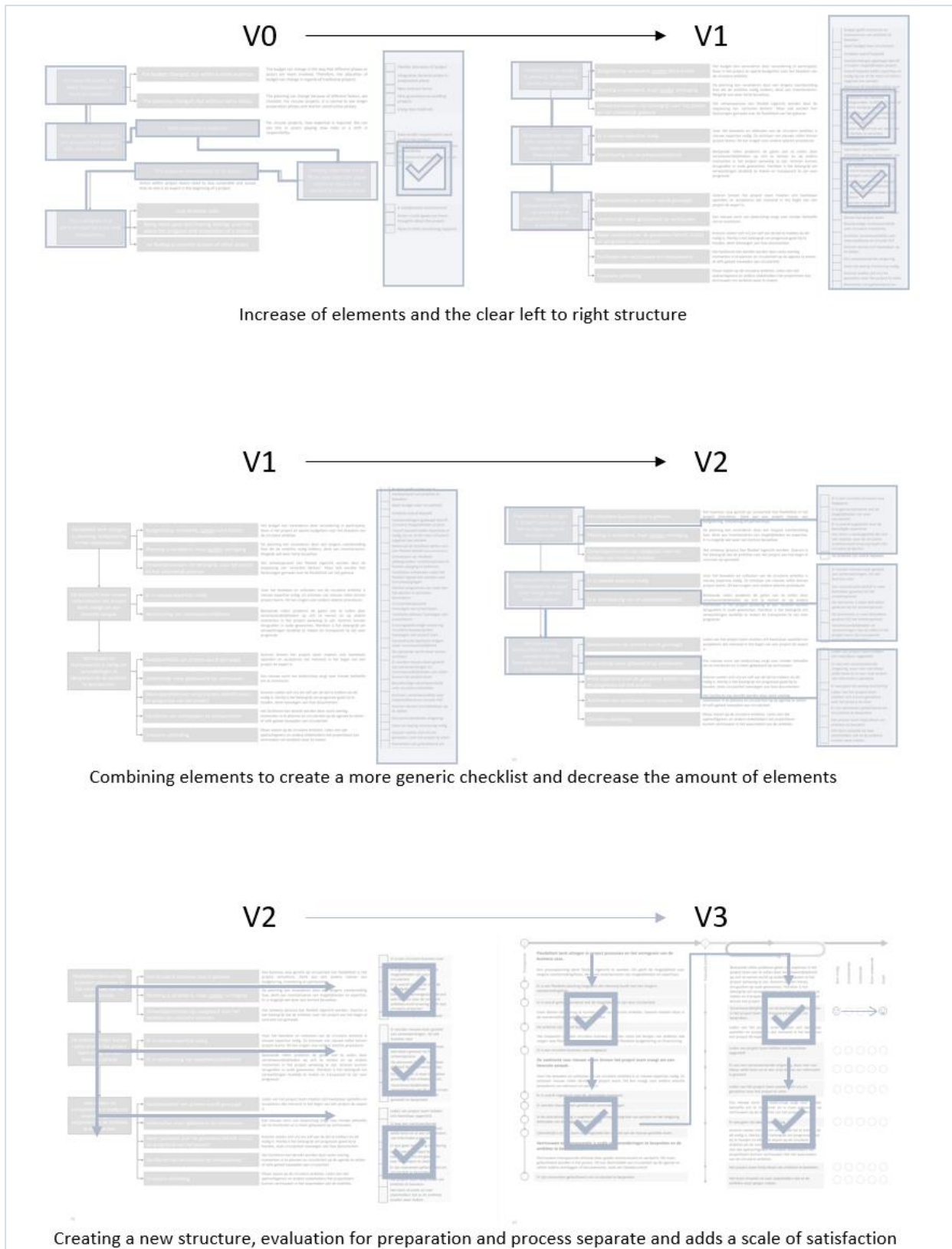
Figure 14: Development of tool V1 to V3 (Own figure)

V3 → V4

Increase of elements in the evaluation, improvement on content for the preparation

V4 → V5

Addition of the section of 'define the field' and the scale of satisfaction at the preparation part

V5 → V6

Improvements are made in the content of the tool and the distinction between left and right is made more clear
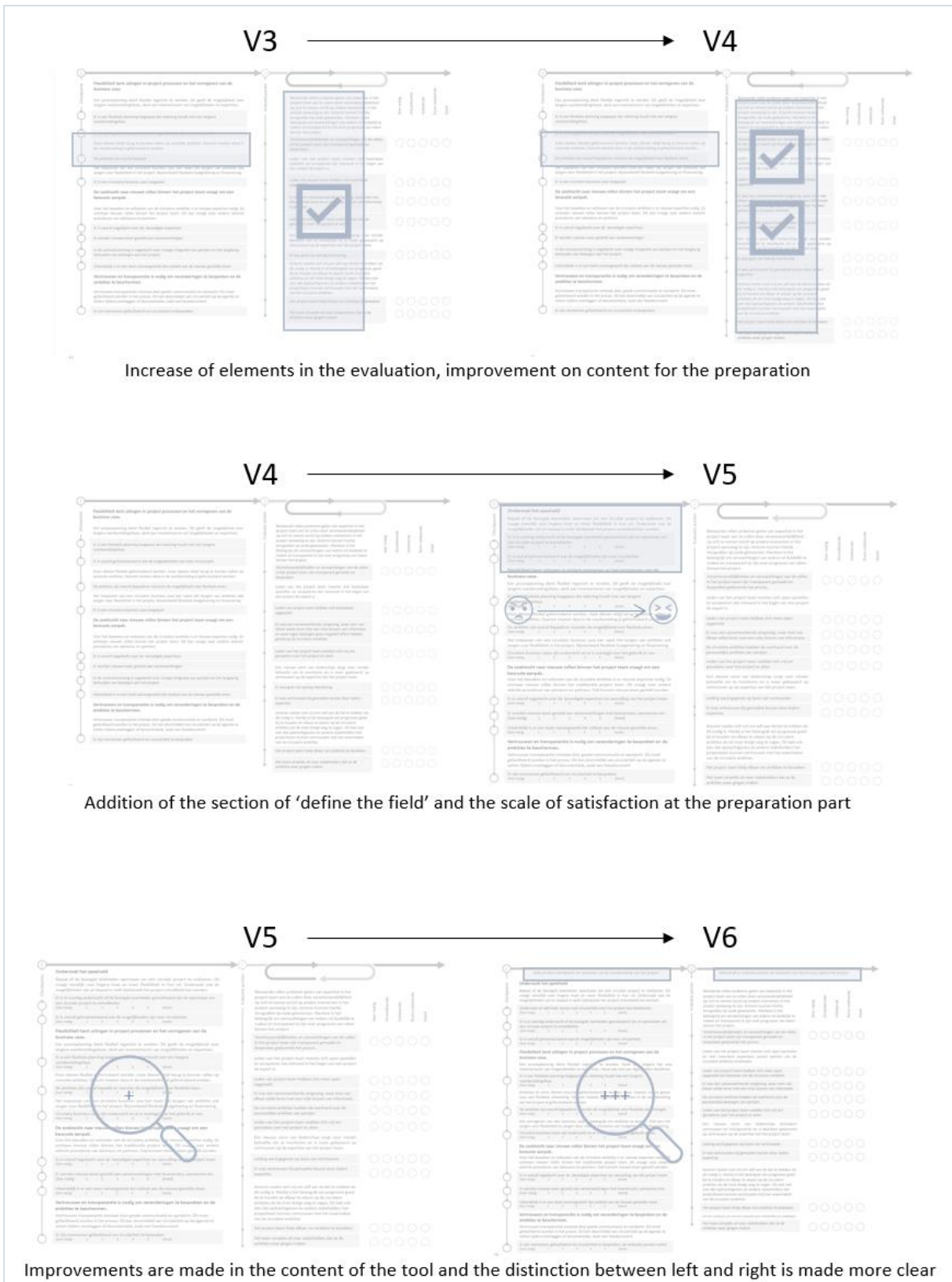
Figure 15: Development of tool V4 to V6 (Own figure)

Development of tool VFinal

The substantiation of this version is the expert validation, referred to as expert validation.

1 Which project dynamics are useful for integration in the tool and what can be deleted from the tool?

Having circular ambition does not have to come from the client. In the expert validation (section 1) it is mentioned that in some cases the client does not have any circular objectives and it is up to the members from the architectural firm to initiate this (expert validation, section 1). For this research, the client is considered a member of the initial project team. Therefore the explanation from section 'define the playing field' now mentions that the project team also includes the client. Then the possibility that a municipality has already stated clear circular ambitions in their administrative law (expert validation, section 1). This should also be considered while defining the field, and thus integrated as well in researching opportunities. For the development of the business case, risks should also be considered (expert validation, section 3). This is added in the explanation of the section about the flexible planning. The last checkpoint from the struggle for new roles is deleted, which mentioned that the composition of the team took place, based on the new requirements. This is because it was mentioned by the experts (section 4) that the first and third checkpoint showed too much overlap and therefore the third checkpoint was considered unnecessary.

2 How could the interpretation of the project dynamics in the tool be improved to better represent the available findings?

The experts found that the second part of the checkpoints, explaining how flexibility and the business case should be developed, shows the triangle of time, quality and money. It was mentioned that these three elements form the business case and therefore the third checkpoint should focus more on the money aspect, addressing financial feasibility or financial requirements (expert validation, section 3). For this reason the third checkpoint is rewritten. The mention of the circular business case is moved to the explanation, and the checkpoint now suggest to determine financial requirements. The experts (section 2) also consider the evaluation points too generic at this point. It is suggested that these question should be a bit tricky to evoke more reaction (expert validation, section 2). Therefore more objective question should suffice, while not losing the intention of the former evaluation points. At last it is suggested to write the dynamics in present time, this creates the feeling that action should be taken and not that they are finished (expert validation, section 2). This is integrated in the formulation as well.

3 How could the content of the tool be presented more clearly for the user of the tool?

It is suggested that the tool should call for action and therefore provide clear titles to the sections (expert validation, section 2). In the final version, the titles are rewritten to call for action, but in a way the content of the previous title is not lost. The title of 'define the playing field' provides a great example (expert validation, section 2).

Clear instructive titles, specification of elements and the reformulation of the question to trigger action

Figure 16: Development of tool V6 to VFinal (Own figure)

5. Discussion

The content and structure of the initial version of the tool was derived from literature about the dynamics in project teams and learning theories and concepts. The process of this development is explained in section 3.3. Through focus groups and in-depth interviews the tool is developed further without much validation on that literature. In this chapter a retrospect is provided to this literature and an elaboration is given on the interpretation of the findings.

5.1 Retrospect and broadening of literature

The content of the initial tool was based on the research of Kooter et al. (2021), and their explanation of temporal dynamics in interorganizational projects. The first that was selected for the tool was the dynamic of flexibility. Kooter et al. (2021) emphasize on the need of flexibility due to uncertainties and focuses on flexibility in the planning an budget. This research has found this as well but in addition provides a broader perspective, namely that flexibility requires a new attitude of team members, which can be challenging (CCH.1, section 1) or the suggestion that flexibility could be an ambition itself (IdB.1, section 2; interview client, section 2). The second dynamic selected was the struggle for new roles, explained as new expertise required during the project, a shift in responsibility and presence in phasing and a new type of leadership based on trust (Kooter et al., 2021). In the research each case sought for additional expertise, case Ipse de Brugge looked for expertise in materialization, Circular

City House for advice on circular business models and Sporthal Bredius had a circular adviser integrated in the project team. Also a shift in responsibilities was recognized, with the example of the architect doing more product thinking then function thinking (SB.1, section 2). The presence of deconstruction firms in the preparation phase, addressed by Kooter et al. (2021), is not found. However, case Sporthal Bredius thought of a fully demountable steel structure. The new types of leadership is recognized and especially emphasized in the case of Sporthal Bredius, where it is mentioned that leadership should stimulate transparency and trust (SB.2, section 5). Transparency and trust was a dynamic in itself, which can create more flexibility. It means that relations are based on trust, members feel free to share risks and feelings and therefore there is no feel to monitor (Kooter et al., 2021). The research provided the insight that project teams are well aware of the importance of this dynamic. Nonetheless it is found that project teams are not sure how to stimulate this effectively (SB.2, section 6). Therefore it is said in all cases that trust and transparency must be facilitated and protected.

In figure 9, the conceptual framework is presented, showing the focus of this research but also emphasizing on the focus of the tool and the actions it intends to stimulate. For the development of this model it is stated that the tool should enable higher order learning, which reflects on the problem and tries to change norms, values conviction and the goals of the learner (Brown et al., 2003). The tool VFinal enables this, by showing what steps ought to be taken and explaining the importance of the project dynamics. In addition the scale of satisfaction can provide different answers, which stimulates the conversation between members on how to improve the process if necessary. However, it is uncertain if the tool is interpreted this way by the user. Therefore, it is interesting to see how in this research the members in focus groups did interpretate the tool. For this, the single- and double loop learning processes can be used to see which learning process is more occurring in the tool. This would provide insights in what practitioners are more interested in to learn. This analysis refers back to the lower two elements of the conceptual framework, as they are the focus of the tool – see also section 3.3.

Single loop learning identifies the problem in its context, correct actions, but does not reflect on it on a higher level (Argyris & Schon, 1974). In the tool, it is assumed to result in direct questions or actions for a specific part of the project, without suggesting or requiring any deeper investigation or reflection on the answer it provides. The double loop learning does reflect on the problem and correction (Argyris & Schon, 1974). Therefore it is assumed that this results in the need for further investigation on the answer and/or follow up questions, for example looking for underlaying conditions to this dynamic. This analysis is done in the perspective of the evaluation, so if the project dynamic is integrated or not and how well this is done.

For the single loop learning the following project dynamics can be selected. The first is about researching and defining circularity. This dynamic checks if the project team took the time to determine a definition for circularity. It was integrated into the tool because it can benefit the project further (SB.2, section 7). However, the integration of this dynamic does not require further reflection or investigation in addition to what the dynamic suggests, therefore selected as a dynamic for single loop learning. The second dynamic is about the formulation of ambitions and requirements. This dynamic suggest to formulate the ambitions in the beginning. It is simple to identify if this was a problem as it is easy to see when ambitions are determined. The project team could then then integrate this dynamic, if necessary, earlier in the preparation phase. Therefore it does not require to look for any underlaying conditions, which would place it in among the single loop learning processes. The third dynamic is about discussing and determining the financial requirements for the circular project. This dynamic suggest to make specific requirement for the project, but does not require any reflection on underlaying conditions or impact on other projects for the integration. This could be possible for this dynamic, however that was not found in this research, therefore also selected for the single loop learning process. The following dynamics have the similar characteristic of being project specific and not requiring any deeper reflection to be successfully integrated in the tool. These are:

- Think of new expertise and roles as addition to the project team beforehand
- Determine new requirements for the collaboration with partners
- Make expectations and responsibilities of team members transparent and discuss them among the team during the process
- Discuss risks and progression during the process to work transparently with all expertise
- Create a free flow of information that members can access easily to learn from other expertise.
- Make sure the circular ambitions overrule personal interests.
- Trust the expertise of members in the project teams when they make a decision
- Keep each other accountable for protecting the circular ambitions
- Show stakeholders that the project team is capable of fulfilling circular ambitions successfully

For the double loop learning the following dynamics can be selected. The first is about the examination of motivation among members. This dynamic asks members if they have scheduled conversation to examine the motivation of intended members. It requires the ones that are defining the field to think on what is a motivated member and how would this effect the process. It requires them to think on underlaying conditions of motivation, with for example the new attitude that is required to work in more flexible environment (CCH.1, section 1). Secondly, the research and inventorization of circular opportunities. It is selected for double loop learning as it can be considered that opportunities found,

do not all have to be used in the project, but can be useful in other projects. In addition, the evaluation of this dynamic could result in the underlaying condition that needs to be solved, which could be a too short preparation phases. And therefore extending this phase would benefit this dynamic (IdB.1, section 1). The third dynamic is about making a flexible interpretation of the process planning. The tool does present underlaying conditions for this dynamic, namely the set deadlines and risks, that need to be investigated first. For these underlaying conditions, the impact should be determined to develop the planning in this manner. Therefore it is selected for the double loop learning process. Then as fourth dynamic, facilitating moments to evaluate and discuss the process. This dynamic requires to reflect on the project and what is necessary to do to facilitate these moments. Questions can be raised on how many times do you have to meet and in what conditions. It reflects on underlaying conditions that would facilitate the discussion for the better. Then the dynamic on taking suggestions and concerns seriously when addressed by a member of the team. This dynamic requires the project team to reflect on the impact of the suggestion. But also to look for underlaying conditions of why it is suggested by the member, resulting in underlaying problems of which the solution can be used to better resolve the issue of the member suggesting. Then at last the dynamic about using trust as a basis for leadership. This is considered double loop learning in the focus of the tool, because to act on this new type of leadership, you have to reflect on the effect it has on trust and transparency in the team. Or the other way around, how you can base the leadership style on trust. This raises new questions which require further exploration.

While conducting this analysis it remains difficult to precisely determine if a project dynamic in the tool is a single- or double loop learning process, as this is still a matter of interpretation. But nonetheless, it is interesting to see that in the reasoning used for this analysis the single loop learning processes occurrs twelve times and thus more than double loop learning, which occurs six times, see also figure 17. Therefore it can be said that the members in project team are more interested in single loop learning processes, what means that they prefer to learn direct lessons, specific for the project with clear actions to follow. It is assumed that the reason for this because they do not know what they do not know, so they will learn what is presented by the tool, and are not aware of what can be questioned next or what to investigate further. Interesting to see is that in the part of define the field, double loop learning occurs two out of three times. It is expected that this has to do with the fact that in this part of the project, the awareness of the impact the dynamics have on projects is more present, as the project itself is not yet defined. Once the project is more defined, later in the preparation and during the process, single loop learning takes over. It is expected that once the members have gained more knowledge on circular project dynamics and the integration of them in their project, they will be

able to reflect better on the lessons learned and double loop learning would to become more prominent in the whole project and therefore also in future evaluation tools, similar to this one.
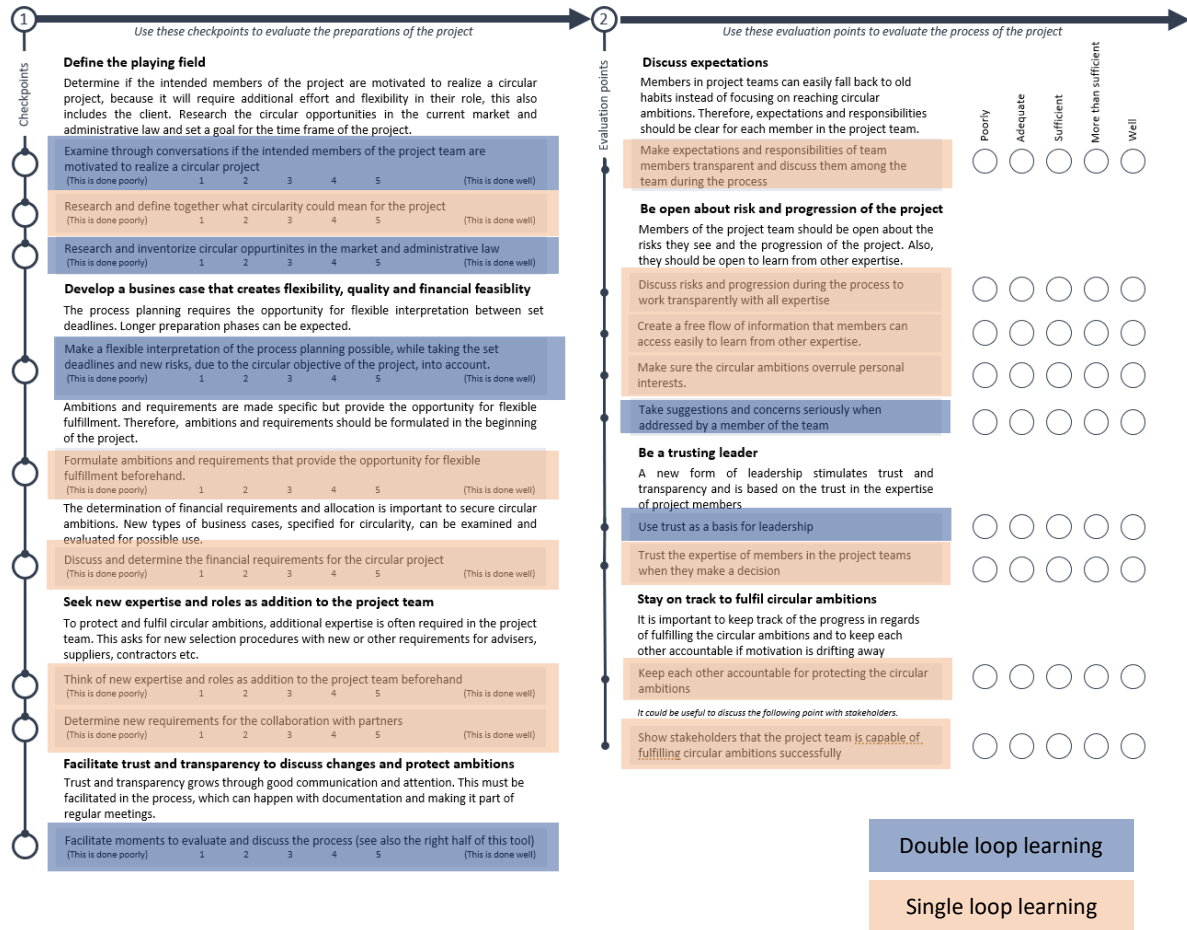
Figure 17: Occurrence of single- and double loop learning in the tool VFinal (Own figure)

Learning using the project based learning strategy enables members to transitions knowledge between construction projects, through evaluating one project and sharing the lessons learned (Liu, 2021). Due to the research not able to validate the learning process of the members sufficiently, the effectiveness of using the learning strategy of project based learning could not be validated either. However, it is examined that the tool can provide more than an evaluation tool. It is derived that the tool can be used as template for a plan of action at the start of a project (IdB.2, section 5). Or as a tool for the process manager (Interview consultant, section 5).

5.2 Interpretations of findings

To interpretate the findings, it is important to state that it became clear during this research, that the process of a commercial project compared to public project is too different to assume that a generalized tool could be made for both. Therefore, it must be mentioned that the checkpoints to evaluate the preparation of the tool, will fit a commercial project better than a public project. This is because the tool does not integrate the mandatory tender procedure (Aanbestedingswet) present in public projects. The lack of this integration can create confusion in the evaluation of the preparation. The evaluation points for the process, would still suffice.

Secondly, the tool provides the means to evaluate and anticipate a project. However the real impact the project has on the environment cannot be secured. In other words, scoring very high on the tool, does not mean a successful circular project immediately. In addition, circularity itself is hard to measure. Luckily several measures can be used, such as the LCA (Life Cycle Assessment), of which Joensuu et al. (2020) state that it should be explored more. Nevertheless, these are not included in the tool. Then, there is always the risk that tool is not used as is intended. As mentioned before, the tool can become a goal in itself, but it is also possible that certain dynamics are misinterpreted. This is because this research tries to put something complex as a circular building project on a single sheet of paper. To do this, only key project dynamics can be addressed, while only suggesting more specific actions for the project team to fill in themselves. Within this interpretation of the tool, it is not sure if the members responsible are capable of doing so and if the tool is therefore used in full potential.

In other words, the bottom-up approach is reliant on the project teams to take action, as the mindset of this research is to be hopeful instead of just optimistic. Still, some concerns need to be addressed for this approach. Firstly, Joensuu et al. (2020) state that the transition towards CE is a cross-disciplinary development. Therefore for the implementation of CE, a large commitment is required from stakeholders in the whole supply chain, including committing to large risks (Joensuu et al., 2020). Secondly, as projects become more complex, it is assumed that expertise, intellect and problem solving, creativity and stress resistance will be more and more important. Therefore, project teams are ideally selected with members that have these traits. However, this is not always possible. Derived from this it can be said that in the near future a discussion could emerge whether members not having suitable traits would be excluded or that everyone should learn these traits. This could raise the ethical discussion if all existing roles in project teams of traditional projects should be present circular projects and what this means for the existing workforce.

At last it is interesting to see where in the transition the tool can be of use. CB'23 (2020) elaborates on three phases in the transition towards CE, experimenting phase, accelerating phase and the

institutionalizing phase. In the experimenting phase new information and data is gathered and validated to find a new way of doing and thinking is implemented. In the accelerating phase the new concepts are combined and more industries join the circular way of thinking. The institutional phase is reached when circular thinking becomes the 'new normal' (CB'23, 2020). Based on these definitions, it can be said that the tool finds its purpose in the experimenting phase and that we are still in this phase as well. Gerding et al. (2021) suggests that when the project teams have the knowledge to implement circularity by themselves, CE can become common practice. Based on this criteria it can be argued that the tool will lose its value when the institutionalization phase is reached, substantiating even more that it is a tool to help the *transition* towards CE.

6. Conclusion

In this chapter a brief summary of findings is provided, followed by the answer on the main research question. Then, the answer is further discussed, elaborating on the value, limitations and scope of the answer. This results in the recommendation of implications for researchers.

6.1 Answering the main research question

The research aims for a consolidation of circular project dynamics to help members in project teams to learn about the integration of the dynamics in construction projects. With this, it aims to stimulate the realization of circular ambitions. The main project dynamics added through this research are dynamics in the section of 'define the field', research and consider a circular business case, think of member's responsibilities and expectations and make this transparent and at last make each other accountable of protecting the circular ambitions. Not many dynamics are directly deleted from the tool. However in some cases, dynamics that were considered too specific were combined into something more generic. For example the individual dynamics of each expertise assumed required in the tool V1, which were then combined in 'determine additional expertise required for the project team'. Some dynamics were improved during the development. For example the flexible planning became more specific in that strict deadline are inevitable, but flexibility is considered in the interpretation of it. And some were rewritten to emphasize on what to do and not what not to do, in other words a positive approach. For example, no feel to monitor became stimulate transparency. Other dynamics were rewritten to be more specific and active, for example 'members were more open' became 'discuss risk and progression'. The structure of the tool is developed from a road map towards a two-side evaluation list. The scale of satisfaction is added to create nuances in the answers of the members in project team and therefore stimulate the conversation and reflection.

The main research question is as followed:

How are project dynamics for circularity in construction projects consolidated into an evaluation tool that helps members in project teams learn about the integration of these dynamics in construction projects?

The answer to this question is that the project dynamics found in this research suggest checkpoints to use during the preparation of the project and evaluation points for whole process. This created two sides of the tool. The check- and evaluation points are equipped with a scale of satisfaction to stimulate nuances in the reaction of team members and therefore stimulate conversations. Both check- and evaluation points are written in a positive, active and present manner to emphasize that actions can be improved or yet taken and are not finished. The consolidation of dynamics in this manner helps members of project teams to learn about the integration of project dynamics for circularity in construction projects to stimulate the realization of circular ambitions. See separate document for the tool in full resolution and size. *Continue on the next page*

Use these checkpoints to evaluate the preparations of the project

Use these evaluation points to evaluate the process of the project

Rating scale: Poorly · Adequate · Sufficient · More than sufficient · Well

Define the playing field

Determine if the intended members of the project are motivated to realize a circular project, because it will require additional effort and flexibility in their role, this also includes the client. Research the circular opportunities in the current market and administrative law and set a goal for the time frame of the project.

- Examine through conversations if the intended members of the project team are motivated to realize a circular project
  (This is done poorly) 1 2 3 4 5 (This is done well)
- Research and define together what circularity could mean for the project
  (This is done poorly) 1 2 3 4 5 (This is done well)
- Research and inventorize circular opportunities in the market and administrative law
  (This is done poorly) 1 2 3 4 5 (This is done well)

Develop a busines case that creates flexiblity, quality and financial feasiblity

The process planning requires the opportunity for flexible interpretation between set deadlines. Longer preparation phases can be expected.

- Make a flexible interpretation of the process planning possible, while taking the set deadlines and new risks, due to the circular objective of the project, into account.
  (This is done poorly) 1 2 3 4 5 (This is done well)

Ambitions and requirements are made specific but provide the opportunity for flexible fulfillment. Therefore, ambitions and requirements should be formulated in the beginning of the project.

- Formulate ambitions and requirements that provide the opportunity for flexible fulfillment beforehand.
  (This is done poorly) 1 2 3 4 5 (This is done well)

The determination of financial requirements and allocation is important to secure circular ambitions. New types of business cases, specified for circularity, can be examined and evaluated for possible use.

- Discuss and determine the financial requirements for the circular project
  (This is done poorly) 1 2 3 4 5 (This is done well)

Seek new expertise and roles as addition to the project team

To protect and fulfil circular ambitions, additional expertise is often required in the project team. This asks for new selection procedures with new or other requirements for advisers, suppliers, contractors etc.

- Think of new expertise and roles as addition to the project team beforehand
  (This is done poorly) 1 2 3 4 5 (This is done well)
- Determine new requirements for the collaboration with partners
  (This is done poorly) 1 2 3 4 5 (This is done well)

Facilitate trust and transparency to discuss changes and protect ambitions

Trust and transparency grows through good communication and attention. This must be facilitated in the process, which can happen with documentation and making it part of regular meetings.

- Facilitate moments to evaluate and discuss the process (see also the right half of this tool)
  (This is done poorly) 1 2 3 4 5 (This is done well)

Discuss expectations

Members in project teams can easily fall back to old habits instead of focusing on reaching circular ambitions. Therefore, expectations and responsibilities should be clear for each member in the project team.

- Make expectations and responsibilities of team members transparent and discuss them among the team during the process

Be open about risk and progression of the project

Members of the project team should be open about the risks they see and the progression of the project. Also, they should be open to learn from other expertise.

- Discuss risks and progression during the process to work transparently with all expertise
- Create a free flow of information that members can access easily to learn from other expertise.
- Make sure the circular ambitions overrule personal interests.
- Take suggestions and concerns seriously when addressed by a member of the team

Be a trusting leader

A new form of leadership stimulates trust and transparency and is based on the trust in the expertise of project members

- Use trust as a basis for leadership
- Trust the expertise of members in the project teams when they make a decision

Stay on track to fulfil circular ambitions

It is important to keep track of the progress in regards of fulfilling the circular ambitions and to keep each other accountable if motivation is drifting away

- Keep each other accountable for protecting the circular ambitions

It could be useful to discuss the following point with stakeholders.

- Show stakeholders that the project team is capable of fulfilling circular ambitions successfully

Figure 18: Tool VFinal (Own figure)

6.2 Scope and limitations of the research and conclusion

The tool that is developed in this research is usable within organization that lack the expertise to kickstart a circular building project. It is made general and flexible to use in different types of projects and in different phases. The tool does not provide answers on 'how', but provides the opportunity for project teams to talk about implementing circular project dynamics. The evaluation tool is developed for members in project teams of construction projects and should be used together with the members. The tool is initially developed for the members that are present at the beginning of a project including the client, but new members can be integrated in the evaluation process as well, once they are added to the team.

For the members that participated in this research, it is observed that the research method can be demanding on them. This is due to the two sessions that were planned, reserving a hour in the agenda of the whole project team. This resulted into members cancelling the last moment or arriving later and leaving sooner. For one of the cases the attendance at focus groups, is considered insufficient. It is assumed that had to do with communication errors and because this research not a priority of the company. In reality, it resulted into more of in-depth interviews with the participant being substantiated by the team experiences. It is assumed that this is the result of not integrating the participation requirements in the case selection, but only focusing on case requirements.

Nevertheless, the combination of the three cases for this research seemed essential, therefore the findings of the case, with insufficient attendance, is still used as valid data. The cruciality of using the three cases can be explained as follows. When an insight is obtained from one case, another case can validate this insight, with either confirming or denying it. However, a third case is required to deliver a final confirmation, as the validation of the second case could still be coincidence. In practice, this meant that with the cross-case reference between cases, insights could immediately be validated with the other cases. And as explained by Yin (2013) the cross-case reference provided the opportunity for analytical generalization and to develop a theory. But it is unavoidable that the sequence of the cases influenced the development of the tool. This is because, each case had a leading theme, and integrating this theme in a different stage of the development would result in this theme to become more or less present in the tool. For example the dynamics of 'define the field' were added in tool V5, but it is assumed that if this was added earlier, through organizing the case from it was derived, in the beginning of the research, this would have a greater role in the tool. Therefore it can be stated that, the tool VFinal, is not the only consolidation of the findings into a tool and multiple tools can be made from these findings. The influence of the order of the cases could have been solved by developing the tool after all findings are gathered, but then the opportunity would be lost to validate the tool itself in the focus group.

The structure of the focus group and interviews were based on the semi-structured and inductive approach – see section 3.5 Data collection. This provided the opportunity to discuss subjects that were raised during the sessions and interviews and not thought of in the preparation of them. The inductive approach enabled the research to develop theories and combine findings into concepts, without a predetermined prejudice. Therefor it is considered that a synergy is created of the obtained findings.

During the focus group sessions the script proposed elements of the nominal group method to range the dynamics in importance. Due to lack of time not all sessions did feature this, therefore this data was not reliable for this research. Then at last, the tool suggests to discuss and research aspects of the circular project dynamics, but it does not check if the user of the tool is capable of this to reach circular potential. This is because it is assumed that to reach the circular potential, the users of the tool should be motivated and committed to use the tool effectively and follow the suggestion well, but also able to be critical and knowledgeable enough to evaluate and improve the project preparation and process if necessary.

The last limitation to address is on the validation of the learning theories and concepts used to substantiate the development of the tool, for example the first- and higher order learning. As mentioned, the dynamics can be interpreted by either single- or double loop, but this research does not provide a definitive answer for this. Also the effectiveness of the strategy that is selected for the tool, which is project based learning, is not validated in this research.

6.3 Recommendations for future research

Future research could provide answers to in what extent the top-down approach can facilitate this tool and the overall transition towards CE and in what balance it should be with the bottom-up approach. In a commercial perspective, this means if the suppliers should change the way they sell their products, or how a manufacturer can keep ownership of the material to secure longer lifecycles. For the public perspective, new ways of tendering can be explored, to provide more freedom in selecting the best possible market party. As for the tool, it can be developed further, using more cases to be able to better serve both commercial and public projects. It is also recommended to focus on certain project dynamics within the tool, to investigate the difference in contribution to realize circular ambitions. And at last, the recommendation to do future research on similar evaluation tools based on other temporal dynamics found in the research of Kooter et al. (2021), as is assumed to be closely related to the tool developed in this research.

Additional research should provide conclusive insights in the validation of the single- and double loop learning process in the tool. But also how the project based learning strategy holds and if this requires further development, addressing the triple loop learning process. Another recommendation would be

to research how the lessons learned can be scaled up to organizational level, based on the argumentation of Gronheid (2021) on this matter.

In addition four interesting research recommendation can be given for CE in general. First is the research into other barriers for the transition towards CE, addresses in chapter one. Secondly, the recommendation to research how far we are in the transition towards CE and what is still required to continue or accelerate the process. Thirdly it is recommended to do research in what ratio the CE solves the two main problems challenging our existence, first being the greenhouse gasses and secondly the exhaustion of the earth resources. And at last, more bound to this research, how effective are circular business cases and for what project do you need which circular business case.

7. Implications for practitioners

In this chapter a prerequisites are given for future tool developments based on seven additional criteria found in this research. Then a brief recommendation is provided for the user on how to approach and use the tool.

7.1 For future tool developments

In section 3.3, four criteria are mentioned that were used to develop the tool during this research. Seven additional criteria are derived from the finding of this research and can be used to further develop this tool or develop other tools with similar aims. For the latter option it is important to say that due to variations in the aim of the tool and the context for which is developed, not all criteria can be used every time. Therefore it is recommended to have a critical view on these criteria before selecting them in future developments. Below the criteria are presented.

When developing an evaluation tool, it is recommended that the tool should…

5. **be clear on how to use it.** The tool should explain itself and not require additional explanation. This makes sure that everyone can use the tool and threshold to actually use it is low.
6. **be scalable.** The tool uses a scale of satisfaction to quantify the evaluation. This is because just doing something does is not enough to learn lessons from. The tool must provide scalability to say if something that has been done is done poorly or well.
7. **stimulate conversation.** Because of the rating system for each dynamic, it asks the users to think how satisfied they are. Different answers among them will raise questions and stimulate the conversation.
8. **be flexible.** It should be possible for the team members to use the tool in multiple stages of a process. Also the dynamics should be written to provide room to specify further or add specific tasks and requirements that can be integrated into the process to reach higher satisfaction.

9. **say something about the project preparation and evaluation concurrent to the process.** To make sure the project has the right foundation to reach circular ambitions, it must be clear what to prepare and how this must be approached. Then in order to provide the project team with the right collaborative mindset the evaluation points for the process should also part of the tool.

10. **be used as a means not a goal.** When given to the user, the risk arises that the tool will be used as a goal in itself. This means that only discussing the content of the tool and not implementing the lessons derived from the discussion. Then tool will not provide the valuable lessons required and it will result in the tool not be used in its full potential. However, this risk can be mitigated when it is used as a guide for the process manager. He or she can then use the tool as a template to create what is necessary for the project at that moment.

11. **tell what to do and not what not to do.** Telling users what to do provides more motivation to think differently and does not give the feeling of constraints, but creates more room for opportunities. Therefore, formulate actions that the user can execute.

7.2 For the user of the tool

Then a short note for the users of the tool. Three things are important. First, the tool recommends to do research on several aspects of circularity, such as the definitions or expertise required. Do this in your best capabilities. When done so, this will benefit further steps in the process. Secondly, try not to skip checkpoints, they are put in this order as they show clear relationships between one and another. It is possible to specify checkpoints into smaller actions, but try to stay on the proposed story line. The order of evaluation points is less important. Then at last and third, because the tool is intended as a project based learning tool, keep the principles of Liu (2021) in mind while using the tool: owner commitment, social environment approach, collaboration vision, value orientation and open mindset.

In the preface the report started with a quote from Orr (2007) about hope and optimism. I am curious if this research inspired you to be hopeful as well, to roll your sleeves up and become actively engaged in defying or changing the odds.

Goodluck!

Reflection

What is assumed to happen during social research is what is called population thinking. This is a definition I learned from reading the book 'How Emotion Are Made', from Lisa Feldman Barrett[1], where she explains that the classical model on emotion gives each emotion a particular *fingerprint* (changes in the body and facial expression). In her book she counters this by showing evidence on how emotions have various expressions, based on the individual experiencing the emotion and context the individual is in. In perspective of my research I experienced the same thing. Studies, for example from Kooter et al. (2021) and Gerding et al. (2021) try to define variations from different cases into generic dynamics and practices of multi-actor environments. This is useful to look at a population, in this context the average project team, in general. It helped me to create the initial tool V0, which was substantiated with dynamics, learning theories and concepts. But when I discussed this with project team in the first session, I came to the conclusion that it needed more specification to make it usable for them, so I did. After each following session, I developed my tool based on the new gathered data. Without realizing it, I used population thinking myself. Combining specific dynamics into more generic ones and leave room for interpretation in assumably direct questions. Yin (2013) mentions this as one of the risks in generalization, which is that when you use more casus you are likely to sacrifice the in-depth contextual and insights of a case (Yin, 2013). For now it is assumed that when a project team is using the tool, it needs to specify it first to make it suitable for their project. I want to emphasize that I do not see this as a bad thing, because it enables more project teams to use the tool. Another risk for generalization is that the case studied does not represent the population average, therefore the generalization of findings is not applicable to the population. Yin (2013) addresses that this can occur by not being able to select the right case or lacking data to define the population to represent (Yin, 2013). For my research I believe the latter was the most pressing for the generalization of this research. This is because I knew little beforehand about project teams, their context, nature, motives etc. This knowledge was derived from literature studied during the preparation phase of this research and during the focus group sessions. Which also resulted in the selection of the cases based on case requirements instead of including the selection on the context of the project team members.

Research process and approach

For the P2 moment, only one case was prepared. Feedback on the P2 recommended to select two more cases to be integrated in the research. In the section I explained that the participation requirements should be part of the case selection process. I assume that this is important because the

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[1] Barrett, L. F. (2017). How emotions are made: The secret life of the brain. Pan Macmillan.

participation requirements can select if the company is capable of providing what is needed for the research. Or in addition, on the context and motives of the participants and if they can represent the environment or population that is researched. I recommend future researches to look at this carefully, when selecting cases for their research.

Due to curiosity and an overload of new and interesting insights, the risk of going too fast was inevitable. Having experienced mentors that remain critical on the steps that are taken or on the work that is delivered is important. In addition, writing any article, it is easy to go from nothing to 80%. But the last 20% take more effort to complete, such as sentence structure, word choices, storylines etc. In those cases you need a mentor to be able to discuss with. Therefore, the guidance of my three mentors assisting this research was very helpful.

In addition to the findings of this research, an important personal lesson was also acquired. Namely, that in practice it can be chaotic. It did not matter how well the sessions were prepared, it did not happen as I wanted beforehand. Two reasons are considered. First is that this research is done by a student , who does not have the regard to be taken that serious for professionals to do exactly as told. Secondly, even in the 'big people's world' it can be very chaotic. As the first reason will solve itself in time, the second has to be dealt with for a longer period. During the session it became clear that the objective of the session has to be very specific and that everything that happens during the session is just a means to reach this objective. This mindset helped when things happened that were not planned. Then it could be decided easily if this alternative satisfied the main goal as well, if so, just continue. If not so, look for other alternatives or force to go back to the initial script. This approach asked for a flexible, open and curious mindset, which was a fine and fun way to do research.

Relations with the curriculum

This flexible approach on doing research reminds of the design process when doing architectural courses in the bachelor. In this research the formation of the conclusion was the design objective and the research was the design process. It started with the program of requirements, asking what would be necessary to reach this conclusion, i.e. research questions. When researching or designing the conclusion, you look for insights and consistently check if they fit the requirements. When finished, you conclude your definitive design or in this case, the conclusion as well as the tool.

In the master track Management in the Built Environment, the focus was not architectural design. However the relation can be found in the in the top-down vs. bottom-approaches discussed earlier in this report. The courses provided in this track learn to think both ways. Courses as Building Law and Economics, explain how top-down structures determine the playing field of the built environment. A

course such as the Urban Development Game is a great example of a course that focusses on the bottom -up approach, working together in a team with different interests, characters and goals.

Final words of gratitude

To finish the reflection a great gratitude is deserved to the participating parties of this research as it required a lot of effort for them to participate in this research and make time for it. Especially, with extreme rising building prices, the extreme scarcity of building materials and uncertainties due to the war in Europe, which causes the economy to be very cautious with investments on real estate and the whole nitrogen debate.

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Informed consent focus groups and interviews

Informed consent

Cornelis van Dijk – 4693280 – Masters thesis

This informed consent is made for the HREC. Its purpose is to prepare a verbal informed consent during the focus group sessions with the participant. This informed consent is the basis for the script for the focus group sessions.

You are being invited to participate in a research study to develop a tool to increase knowledge among project teams about circular building projects. This study is being done by me, my name is Cornelis van Dijk from the TU Delft for my Masters thesis. I am guided by three mentors from the TU Delft.

In total we will have two sessions with each other, each sessions takes you approximately one hour to complete. The data will be used to develop the tool further. The first session will be explorative, with question such as, what were success factors for this case regarding circularity. We will focus on flexibility, struggle for new roles and trust and transparency. The success factors are then analyzed and if considered useful, integrated in the tool. In the second session we will use to the tool to analyze the case. With this I can validate the usability of the tool as well as develop it further. For each session I prepare a script to structure the sessions.

I ask of you to have an open discussion and feel free to react on each other on the topics I will explain during the session. I will be here to facilitate this discussion and ask questions if necessary.

I have these to sessions with two other project teams at different organizations, with other cases. So in total 6 sessions. The sessions are organized to have a cross reference between the cases. This means that what is discussed today, will be presented to other organizations. Please be aware of this.

To safeguard your privacy, I want to mention that I address to you in my report as your role. For example, architect, project manager etc. and not by your personal name. The personal information is only administrative so that I am able to contact you if I have any further questions.

Then I would like to address that your participation in this study is entirely voluntary and you can withdraw at any time. You are free to omit any questions. If you feel that any data should be withdrawn from this study, you can contact me in the next three days.

I will provide contact details at the end of the session, if you do not have them already.

This session will be (audio) recorded, therefore I ask for your mission to do so? When I start the recording I will ask again so that this is included in the recording. After that I would like to start this session

Script first session

Focus group script (Case) – Sessie 1 – (Date and time) - Cornelis van Dijk

Voorbereidingen
- Zaal met scherm
- Groep in een kring plaatsen
- Sticky notes klaarleggen met stift
- 1 groot vel per persoon overhouden
- Telefoon gebruiken als opname middel
- Timer aanzetten voor tijdindicatie (zie rood)
- Schuingedrukte tekst betekent *actie*

0-5 minutes: Inleiding

Groep welkom heten en bedanken voor mee doen aan onderzoek

Dia klik

Mijn onderzoek:
- Beperkte kennis binnen organisaties zorgt voor het tegenhouden van transitie naar circulaire economie
- Zoeken naar een methode om kennis te vergroten > Project Based learning
- Lessen geformuleerd op basis van literatuur (onderzoek van mijn mentoren over dynamieken / succes factoren circulaire projecten)
- Lessen vormgegeven in een tool en deze valideren en verder ontwikkelen.

Onderzoekmethode is focusgroep

Deze sessie is de eerst van twee. Ik doe dit ook bij 2 andere casussen bij andere organisaties. Dus totaal 6 sessies.

Dia klik

Herhalen doel van focus groep sessie
- Discussiëren over de succes dynamieken van Ipse de Bruggen Vlaardingen
    - straks meer uitleg over deze dynamieken
- Interactieve manier om nieuwe elementen binnen deze dynamieken te bedenken
- Kennismaken met de tool

Mijn rol in gesprek duidelijk maken
- Gesprek faciliteren > Passieve houding
- Soms een vraag te stellen
- Voel vrij om op elkaar te reageren, maar laat elkaar wel goed uitpraten.
- Ik geef geen eigen mening, het gaat hier om jullie expertise

Benoemen dat er zorgvuldig met bedrijfsinformatie wordt omgegaan. Data alleen gebruikt voor onderzoek.

Melden dat de sessie wordt opgenomen (dubbel gevraagd).

Opname aanzetten

Nogmaals vragen (informed consent)

Dia klik

5-10 minutes: Kennismaken met dynamieken

Mijn onderzoek gaat over succesfactoren voor circulaire bouwprojecten

Als we kijken naar deze factoren binnen project teams, spreken we al snel van dynamieken.

De focus van mijn onderzoek gaat over de dynamieken van:

- **flexibiliteit:** door nieuwe methodes en technieken zijn dingen vaak onzeker en dus is flexibiliteit belangrijk in bijvoorbeeld planning en budget, taakverdeling etc.
- **zoektocht naar nieuwe rollen:** Circulariteit vraagt om nieuwe expertises, in materialen en nieuwe bouwmethodes. Maar ook bestaande rollen krijgen andere verantwoordelijkheden.
- **vertrouwen en transparantie:** Dit wordt behaald als actoren binnen teams en partners open durven te zijn over onzekerheden, risicos en de voortgang van projecten. Ook cruciaal als er een meer flexibiliteit gevraagd wordt.

Dia klik

Vragen of iemand kort wat wilt zeggen over deze dynamieken in de casus, zijn hier al reacties op?

Dia klik

10-12 minutes: Nominal group method ronde 1: flexibiliteit

Iedereen krijgt 2 minuten om elementen te benoemen voor flexibiliteit. Benoem het als een succesfactor. Dus als er iets mistte qua flexibiliteit, hoe zou dit dan wel gedaan moeten worden.

Probeer het zelf te doen, en kijk ook of er vanuit je eigen expertise specifieke dingen zijn te benoemen

12-20 minuten: Bespreken en sorteren op belangrijk
Iedereen kort zijn of haar kaarten laten voorlezen en per keer bepalen of het belangrijker is dan de rest of niet.

Laten weten dat als er tijdens de discussie nieuwe elementen bedacht worden dat dit gemeld kan worden.

Kaarten verzamelen die zijn geweest op tafel leggen in volgorde van belangrijk

Discussie laten lopen over belang per element.

Dia klik

20-22 minutes: Nominal group method ronde 2: Zoektocht naar nieuwe rollen

Iedereen krijgt 2 minuten om elementen te benoemen voor flexibiliteit. Benoem het als een succesfactor. Dus als er iets mistte qua flexibiliteit, hoe zou dit dan wel gedaan moeten worden.

Probeer het zelf te doen, en kijk ook of er vanuit je eigen expertise specifieke dingen zijn te benoemen

22-30 minuten: Bespreken en sorteren op belangrijk

Iedereen kort zijn of haar kaarten laten voorlezen en per keer bepalen of het belangrijker is dan de rest of niet.

Laten weten dat als er tijdens de discussie nieuwe elementen bedacht worden dat dit gemeld kan worden.

Kaarten verzamelen die zijn geweest op tafel leggen in volgorde van belangrijk

Discussie laten lopen over belang per element.

Dia klik
30-32 minutes: Nominal group method ronde 3: vertrouwen en transparantie

Iedereen krijgt 2 minuten om elementen te benoemen voor flexibiliteit. Benoem het als een succesfactor. Dus als er iets mistte qua flexibiliteit, hoe zou dit dan wel gedaan moeten worden.

Probeer het zelf te doen, en kijk ook of er vanuit je eigen expertise specifieke dingen zijn te benoemen

32-40 minuten: Bespreken en sorteren op belangrijk

Iedereen kort zijn of haar kaarten laten voorlezen en per keer bepalen of het belangrijker is dan de rest of niet.

Laten weten dat als er tijdens de discussie nieuwe elementen bedacht worden dat dit gemeld kan worden.

Kaarten verzamelen die zijn geweest op tafel leggen in volgorde van belangrijk

Discussie laten lopen over belang per element.

Dia klik

40-45: Eigen top 5 vanuit de rol

Schrijf bovenaan het papiertje je rol en daaronder jouw top 5 van elementen. Mag afwijken van wat de groep heeft. Kan dus specifiek voor jouw rol. Gaan dit verder niet bespreken

Dia klik

45-55: Conclusie van de sessie
Met elkaar belangrijke elementen voor succesvolle circulair project. Deze zullen mogelijk aanvulling zijn op de eerste versie van de tool die er nu ligt.

Dia klik

Korte uitleg over hoe de tool werkt en hoe de elementen onderdeel kunnen worden van de tool.

55-60: Afronding van sessie

Iedereen bedanken voor medewerking

Einde opname

Aan mij de taak om op basis van de data de tool verder te ontwikkelen.

Volgende sessie zal de tool gebruikt worden om het **(Case)** te analyseren.

Meteen plannen? (nieuwe datum)?

Zijn er nog vragen of andere zaken? **-The End-**

Zijn er nog vragen of andere zaken? **-The End-**

Script second session

Focus group script (Case) – Sessie 2 – (Datum en tijd) - Cornelis van Dijk

Voorbereidingen
- Zaal met scherm
- Groep in een kring plaatsen
- Post-its klaarleggen met stift
- 3x Tool op A3
- Telefoon gebruiken als opname middel
- Timer aanzetten voor tijdindicatie (zie rood)
- Schuingedrukte tekst betekent *actie*

0-5 minutes: Inleiding

Iets lekkers uitdelen en kopje koffie aanbieden

Groep welkom heten en bedanken voor mee doen aan onderzoek

Dia klik

Herhalen vorige sessie
- Besproken over flexibiliteit, zoektocht naar rollen en vertrouwen en transparantie
- De punten die zijn besproken zijn verwerkt in de tool

Dia klik

Vandaag gebruiken we de tool om het project te analyseren

Eindigen met gedeelde conclusie over de tool, met aanbevelingen

Mijn rol in gesprek duidelijk maken
- Gesprek faciliteren > Passieve houding
- Soms een vraag te stellen
- Voel vrij om op elkaar te reageren, maar laat elkaar wel goed uitpraten.

Dia klik

Belangrijk voor we beginnen:
- Probeer met elkaar de tool te begrijpen en te ontdekken

- Bij vragen laat het weten
- Elementen in de uitleg of checklist die weg kunnen of toegevoegd moeten worden kan dat nog. Streep het door of plek er een post-it bij

Dia klik

Benoemen dat er zorgvuldig met bedrijfsinformatie wordt omgegaan. Data alleen gebruikt voor onderzoek. Meerdere casussen andere organisaties

Melden dat de sessie wordt opgenomen (dubbel gevraagd).

Opname aanzetten

Nogmaals vragen (informed consent)

Dia klik

5-50 minutes: Analyse project

Dia klik

50-60: Conclusie van de sessie

Met elkaar de tool kunnen gebruiken. een paar vragen:

Hoe was de bruikbaarheid van de tool? En inhoud

Vragen aan de groep hoe zij zien dat de tool gebruikt kan worden. Mogelijke vragen:

- Wanneer in een nieuw project? Begin midden of eind. of specifieke fase
- Eenmalig, meerdere keren
- Hoe praktisch vormgeven? Generiek model of ontwikkelen per project?

Dia klik

55-60: Afronding van sessie

Iedereen bedanken voor medewerking, laatste sessie voor deze casus.

Einde opname

Aan mij de taak om op basis van de data de tool verder te ontwikkelen. Zijn er nog vragen of andere zaken? **-The End-**

Report on IdB.1

Date: 22-2-2022

Time: 10:00-11:00

Attendees: Architect, project leader architectural executive, architectural engineer and two modelers.

Section 1 – The session started with a brief explanation about the dynamics flexibility, struggle for new roles and trust and transparency. The first thoughts one these dynamics were discussed among the project team. The focus in the beginning was solely on how to optimize the care of the residents. The circular ambitions were a means to obtain priority from local authorities, in the what is called 'Green deal'. The ambitions were then provided by the client, but no active role from the project team or client were present to protect these ambitions. Once cuts were made in budget, the circular implementation were first to go. In addition the circular ambitions were minimally implemented into the building specifications. This is because existing installation are difficult to make circular and little research is done to look for other opportunities. More research would have improved the opportunities to reach circular ambitions. It is suggested that a new standard building specifications document should be made that includes circular implementations.

Section 2 – To reach more flexibility it is beneficial to determine ambitions beforehand, to see what needs to be researched and to be able to look back at it later. For the circular ambitions a separate budget can be implemented and made transparent. This enables the project team to find implementations that fits the budget. Also variant thinking is suggested, which means to think of different alternatives of materials for example at the same time, so that during the process it can be easily altered. This requires more effort and energy from the team that should all do research for opportunities in their own expertise. In the session some elements are discussed, such as a flexible floorplan or installation zoning. It is also mentioned that a flexible statement of requirements should benefit flexibility, as it can give the design more option to use different materials or lay-out.

Section 3 – For the struggle for new roles, several specific expertise were mentioned fitting to existing roles. The architect should provide circularity in the statement of requirements. The project leader should protect ambitions. The modeler should do research for circular implementations in the building. But also external expertise is discussed. For the architect advice should be provided on reusing existing elements, demountable constructions and the market for circular materials. In addition, an experienced member should be able to help the project team. It is considered that it is beneficial if this circular specialist is an employee of the same organization as the project team.

Section 4 – To stimulate trust and transparency it is suggested to facilitate team discussion, weekly or even daily. In these discussion you can discuss the progress and the budget. Also this progression should be well documented. Then you can see if agreements are held and to communicate with the client. For the project team communication is important and trust in the expertise of each member. But to be able to do so, members should be willing to be proactive. This can be of importance as it mentioned that the project team should develop a new identity and role and communicate this to the client to generate trust. The project team is considered the expert and executioner of reaching the circular ambitions.
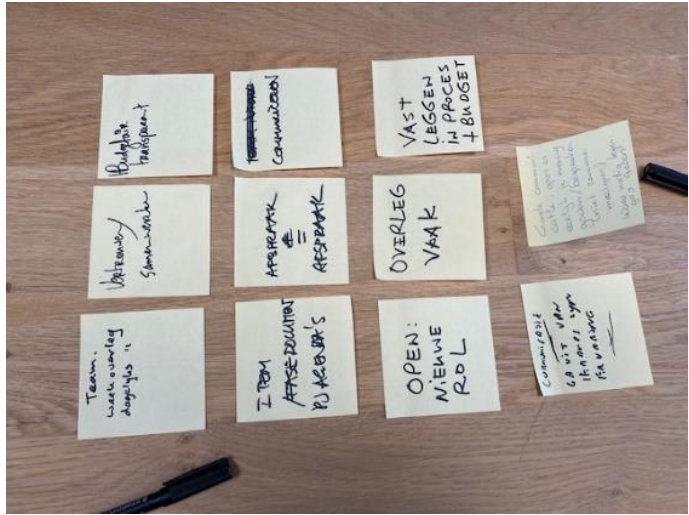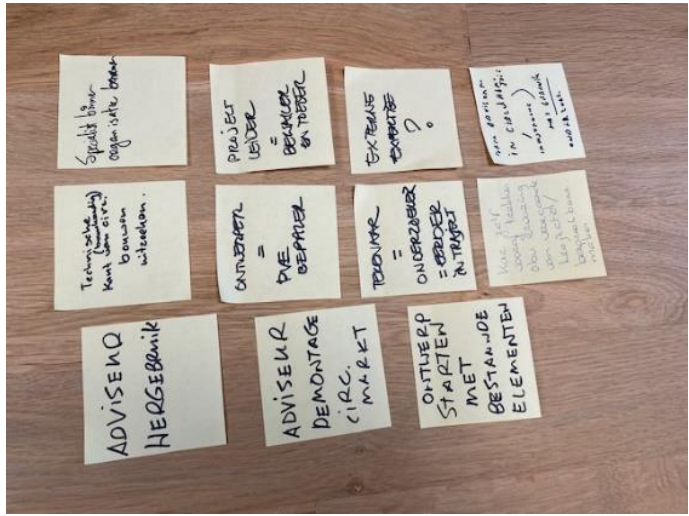
Top to bottom: Flexibility, struggle for new roles and trust and transparency

Report on IdB.2

Date: 15-3-2022

Time: 11:00-12:00

Attendees: Architect, project leader and a modeler.

Section 1 - In the beginning of this session I asked the group if they could use the tool how they thought it should be used. I only explained that on the left an explanation of the elements is given and on the right the checklist is presented. The architect mentioned that she thinks the tool reflects the work process of the project team and then started reading the explanation out loud. The first discussion was about if the explanation on flexibility was true or false, regarding their project process. For example: the explanation suggests that the planning changes. Then the discussion followed if the planning changed for their project. In this discussion, specific design choices were used as substantiation. The modeler for example talks about for more flexibility they should have used a steel construction instead of lime-stone brick. In all these discussions the checklist was not used. I addressed that the checklist should be used to reflect and that the left side was for an explanation. After this the checklist was used more. But still only with yes or no.

Section 2 - The discussion was minimal on the checklist. A question was raised by the architect on the business case and what this meant for the project and program of requirements. I explained that this was about how investments are organized and how partnerships are made. The reaction on this was that the business case belongs more to a client than a project team. The project leader mentioned that it is possible that the client has a business case that the project team does not know of, in case of feasibility of the project or ambitions. Based on this it is mentioned that it would be important to determine if the ambitions of all parties are equal.

Section 3 - In the struggle for new projects the discussion continued about the checklist and evolved into wat type of collaborations are most preferable. The modeler mentioned that a 'Bouwteam' is a good solution, as this involves the constructor earlier in the process. The early integration is preferable as the contractor often has connection with suitable suppliers and the required expertise. The architect and project leader agree on this, as they experience that the engineering of circular project is still a big challenge in the organization. The whole group agrees however, that if this expertise is trained more, the dependency on these partners decreases. Other optional collaboration that were discussed are DBFM(O), and then especially the 'M' of maintain. With this the constructor is also responsible for maintenance, which is an incentive to build with high quality and have the most residual value.

Section 4 - Before continuing the architects asks if the checklist provides the right question in order to determine if the struggle for new roles did have a conscious approach. This concern was noted and used for further development. On the trust and transparency part, the group scored high. They realized that they did not organize everything knowingly, but they still reached high transparency and trust. the only comment was on circular appearance, which was not clear. After explaining the group understood it.

Section 5 - After the discussion using the tool, I asked their opinion on the tool. The group agreed on that the tool could be used in the beginning of a project in order to develop a plan of action. It could also develop during the process by adding checklists or specifying them with tasks. The answers could provide more nuances as checklist can be checked but still it is not sure if done well, in other words, what is evaluated in that case.

Report on CCH.1

Date: 10-3-2022

Time: 13:00-14:00

Attendees: Senior Development manager

Due to Covid, the initial session, 4th of March, could not take place. Therefore this session was planned shorthanded and via teams.

Section 1 - The senior development manager addressed that every project requires a certain amount of flexibility. The way he sees it differently for circular projects is that the business case should facilitate this, which requires a different approach of selecting partners with new requirements and under different conditions. In other words, flexibility comes from the way the business case is described for the project: how cashflows are managed, partnerships are created and the project is made feasible. Three possible business cases were mentioned. Pay per Use – Buy and Return – Lease.

Section 2 - To continue on this, the struggle for new roles, comes from how to finance a project and what deals you make with the supplier. In traditional projects you invest 100% on t=0. For circularity, you could look for the supplier co-investing and then keeping ownership on certain products. To stimulate the quality and long term use of the materials. However, this demands a lot of trust from the supplier, because it can be uncertain until the end if his materials are used. The question that rises with this is, do you look first for finance or for supply. This is debatable. The supplier, is considered a new role for the project team. There should be a synergy between the developer and the supplier.

Section 3 - To create this synergy, the team identity is important. You must stand behind the circular ambitions and be open for the opportunities. It is difficult to make commitment measurable, that it is why it is easy to work with partners with experience already. Important for the commitment and to learn from each other is to have equality within roles and learn from each other. This can be accomplished with making information available for all members. Every expertise has a different view and right now not everyone knows it all.

Section 4 - At last, he mentioned that we are in a phase that tries to prove circularity as a concept. Circular business models still need developments. Also you must know how far you want to go, because it is almost impossible to have a building be 100% circular. But a right balance ought to be found between circularity, exploitations and the future users.

Report on CCH.2

Date: 14-4-2022

Time: 11:00-12:00

Attendees: Senior Development manager

Section 1 - As this case was the first that mentioned a implementation of the circular business case, I decided to start this session to talk about this more in depth. I asked the reason to search for a circular business case. He explained that when you have circular structures, for example recycling, with building elements having residual value, the costs of a product can be lower, because it can be sold again. Then you should be able to build a 'less expensive' building with the same qualities. Also because you can be become technical owner and not financial owner. Or invest the residual value in more quality. Models to finance this are not existing as such, so they researched the opportunities together with suppliers.

Section 2 - Suppliers often think in linear models still. Therefore you need to select suppliers that are willing to do it differently. Then I asked if this project could have been feasible without a circular business case or that is it dependent on it. The answer to this question was that to finance this project they needed a bank. And a bank will not finance a circular model, because they consider it too risky. Therefore the project team worked on a positive traditional business case, and then looked for how to make it circular, using supply chain collaborations. The bank sees this risk as the owner of the building is technical owner, but not financial (ownerships belongs to suppliers and manufactures). So to conclude, a circular business case can only work if it is substantiated with a traditional positive business case. In the end, he concluded that a building should always have a positive business case, circular or not.

Section 3 - After this discussion we started talking about the tool. The tool (V4) starts with the creation of the process planning. The experience for this project was that first they looked for enthusiast people to join the team. Or in other words: 'Define the Field'. He mentioned that of course you start with an abstract planning beforehand, but that the creation of the project team should be sooner in the process. After you have the team, you can develop a detailed planning and look for circular opportunities. This is also because one of the evaluation points is to discuss the responsibilities and expectations transparently. Because you need team members willing to be flexible in this. The element of the contracting was considered vague, but after a brief explanation is became clear. He suggested to explain it differently, as that it should not be a checkpoint, but more as an option to do. This is because he sees the benefits of early integration but also the risk of losing control over the design and project.

Section 4 - Then some smaller issues with the tool. First the word vulnerable, which has a negative feel, maybe change it to 'be openly about'. The element of a collaborative work environment and no negative impact of personal interest should be split in two different elements. As he sees the possibility to have a different answer on both. The last element about the appearance was not clear, because that should be in every project. This should be made more specific on circular projects.

It took a while to understand how to read the tool, but when it became clear it was very organized.

Report on SB.1

Date: 29-3-2022

Time: 11:00-12:00

Attendees: Architect, project leader, engineer, client (municipality), circularity expert, sport facility engineer, contractor and contractor builder.

Section 1 - After explaining the dynamics briefly the group was asked to mention their first thoughts. The client started off with the dynamic of trust and transparency and mentioned that for his role it is very important to trust the project team in realizing the ambitions, which is the case for this project. He adds that this is because this team already worked together on a similar project in Wageningen, which was very successful. The circularity advisor adds, that shared ambitions is very important. The contractor sees a risk in too much trust. He mentioned that for circular thinking you have to think from final construction to structural work, but that some actors tend to fall into old habits and think traditionally. The contractor concludes that it is therefore important to have advisors to keep you on track. The architect sees that for his role, he has to be more of a circular detective trying to find new materials and recipes from suppliers. Therefore focusing more on product than function, minimizing the use of material and look for qualities in the structural construction. The problem is that suppliers will not share this easily, but this has to change according to the architect. When suppliers are more open about their products and residual value of them, it would be easier to select and agree on circular implementations.

Section 2 - After this introduction discussion, the brainstorm started. First flexibility. The engineer started with mentioning the flexibility in installation. The circularity expert added on this, that the installation do not have to be flexible but more the norms they try to reach. If a more circular solution is possible but at cost of minimum change in norms, then this should be made possible. The contractor mentioned that in the built environment a lot of things are modular. But that this could be improved to build even more modular. The architects reacted on this by saying that the process and product go hand-in-hand. As conclusive statement the group agreed that flexible norms could provide the most flexibility, but that the functional implementation should be protected, as well as the safety of end users. Because, as the sport facility engineer addressed, the end-user is central to every project. At last the architect added, that these flexible norms could also be translated into the urban norms, such as building plot and height.

Section 3 - In the discussion about the struggle for new roles, the client mentioned that it is important that the project team collaborates without having too much personal interest. However this is difficult, as a business case is always about money and then different interest are in play, for example the guarantees of a supplier and the responsibility of the contractor. That is why there is always a balance between exploitation and circularity and that the business case should be a means and not a goal in itself. In addition he mentioned that at least someone in the team should be the expert on circular materials. The architect adds to this that an architect could investigate this, by interviewing and researching suppliers, becoming a circularity detective. The sport facility engineer, mentioned that he experienced that he was looking outside his expertise, learning from and helping others. This improved his addition to the team.

Section 4 - On trust and transparency the group agreed that everyone should trust other to make the right decision. The circularity experts adds to this, that actors should trust others even if it is unknown to them, which is the case more often in circular projects. However, the concern is, addressed by the client, that how do we know if the idea now, is still relevant for over 30 years. The contractor

mentioned that transparency is difficult to measure: You only know what you know and you don't know what you don't know. Trust however can be seen in actions and/or references. He continues with the concern that if he shares all financials, others can only see benefits and not risks. In the end, the contractor is responsible. The client mentions that knowing everything is not always ideal. He explains that having different interest is normal, but it is more about how to deal with it and not let it limit the ambitions of a project

Report on SB.2

Date: 29-3-2022

Time: 11:00-12:00

Attendees: Architect, engineer, client (municipality), circularity expert, sport facility engineer and contractor.

Section 1 - After everyone was able to go through the tool, the group suggested to make it more clear that the left part if before and the right part is concurrent the project. Then I explained what is expected of the session, namely a role-play as if the tool would be part of their project. I asked who would take the lead and they pointed to the client (municipality). He started reading and it became clear that it was unclear for what team the tool was. This was because, as the client mentioned, you have multiple teams that you form during the process. First the client selects advisors to create an ambition, then the tender procedure starts, which is followed with a new team formation and at last the contractors are added (bouw team). During this discussion I observed that it was difficult to stick to the tool and the conversation shifted many times. After I asked the question that was described by the tool, a brief answer followed and we continued.

Section 2 - The client mentioned that it is not always easy to select the best on circularity, sometimes you have to work with the people you have. However the contractor mentioned that they did look internally in the organization to members that are specialized and motivated for circular projects to present for this team. It became clear during this part of the session that a commercial project is different in process than a public project and that the tool was made more based on a commercial project.

Section 3 - The circularity advisor concludes that it is important to define if a commercial or public and if it is circular from the start or if it is conventional and have the ambitions arrive later in the process. The discussion continued but the role play has stopped and it became a feedback session instead. I accepted this, because it did not have any benefits the force the conversation in a certain direction. The circular advisor continued with that a risk is that the tool does not check if the user (read: process manager) is capable of leading or has enough expertise for a circular project. I noted this.

Section 4 - During the discussion on flexibility it was not clear for the contractor what type of planning was meant. The circular advisor and architect mentioned that the contractor is mostly focused on construction and that this was more on process. The group agreed that a flexible planning is always the bases of a project, but that clear deadlines are crucial to have. Flexibility in the interpretation of the planning is crucial, but as well as strict deadlines. Again I observed that easy question were made very complex, by not reading clearly. Another discussion started on the flexible requirements that were mentioned unclear. The requirements should be concrete and the execution should enable flexibility. Right now it states flexible requirements.

Section 5 - The discussion on trust and transparency went more smooth as this is more process focused instead of project focused, which has more complexities. It was mentioned that someone who is trustworthy has no issues with being transparent. The group agreed that trust might be the start and transparency follows. But it can also be explained the other way around, transparency does always mean trustworthy. As you can be transparent to cover yourself from responsibilities and do it for own benefits. Conclusion is that the project needs both and only one of both is not enough. A great point was given when discussing the element of 'accepting not everyone is an expert'. This is because some members are hired because they are considered the expert. This should be rephrased. At last, again,

the notion of positive suggestion. Leadership with no feel to monitor should be leadership that stimulates transparency.

Section 6 - After finishing the tool, the discussion continued more on the content of the tool. It was suggested that the evaluation side should be based on the preparation suggested in the left, so that you can anticipate on the evaluation. Then it was made clear that evaluation is a good part of the tool but that the preparation part is too dependent on the character of the project, being commercial public etc. The circular advisor mentioned that the tool could help the projects who are doubting on circularity and do not have the knowledge inhouse could use the tool as a guidance to get started.

Section 7 - Then to conclude, the contractor mentioned that a lot of people might be willing to implement circular ambitions, but that sometimes it is not possible because of lack of ability to understand a circular way of thinking and sticking to conventional ways. Also the conversation on circularity should be added in the beginning as well, in other words define circularity beforehand. In the end it was mentioned that the circular business case is not a must, but that it would simply be a business case that makes the circular project feasible. The circular advisor ended the session by mentioning to be pleased with the open approach of the research and that he was glad to be able to have input in the end result.

Report on interview client

Date: 16-3-2022

Time: 10:00-11:00

Attendees: Project manager vastgoed Ipse de Bruggen

Section 1 - After the session of IdB.1, an interview was planned with the client from Ipse de Bruggen. The first question was about what circular ambition did the project had. The client reacted with that no real ambitions were established. As a client, the only focus was on the sustainable norms, set by the government. Circularity was spoken of with the project team, but due to not having any financial support from the government or any incentive (norms / regulations) the client did not see it as a circular project. If the government changes its norms and regulation you could enforce additional budgeting and discuss circular implementations. The circular features in the project, were a means to gain political interest for the 'Greendeal'. A regulation that pushes sustainable projects forward on the agenda of the municipality.

Section 2 - After this general introduction, the conversation continued about the three dynamics. First flexibility. As a client for healthcare a flexible design is already a ambition. The ambition is to design a healthcare residence that is flexible for several care profiles and which has a 30+ year time frame. However, the client addresses that he developed real estate 10 years ago, which were designed as a 30+ flexible plan, but are already disfunctional. This is due developments in the built environment and healthcare. 10 years ago, they developed care facilities that imitated normal housing. Vertical planning, living on ground floor and sleeping upstairs, as in normal houses. This is not the case anymore, now is everything horizontal planned.

Section 3 - For the struggle for new roles, the client mentioned that the business case is the biggest problem. Finding suppliers to partner up with for such long periods (15-20+ years). The reason for this is that, traditionally you write off a building to 0,-. But now, with a building being circular, the building has more residual value. But who is going to promise now, to take a certain module/product/material, for a certain value that is determined today for over 30+ years. Also the client addresses that accountants could be a problem. Because you do not write off a building to 0 but you determine that the residual value is 5%. It is argued if the current economy is ready for such models. The client questions if an accountant is easily bookkeeping these values. When asked for the expertise in project teams, the client mentions that he trusts the architectural firm to obtain the right expertise.

Section 4 - For trust and transparency, the client mentioned that this was well organized. The collaboration with the project team was great, with a lot of transparency about progress and budget. This was also because the program of requirements are preset for healthcare and all installation norms are publicly known. The client mentions that they cannot negotiate on this, as a commercial developer could do. In addition to this, the client mentioned that because they are a health care organization and do not have a commercial objective, the quality of the building is more important than budget. As this is known among the project team, there was trust more trust among the project team.

Report on interview architect

Date: 28-3-2022

Time: 10:30-11:00

Attendees: Architect Ipse de Bruggen
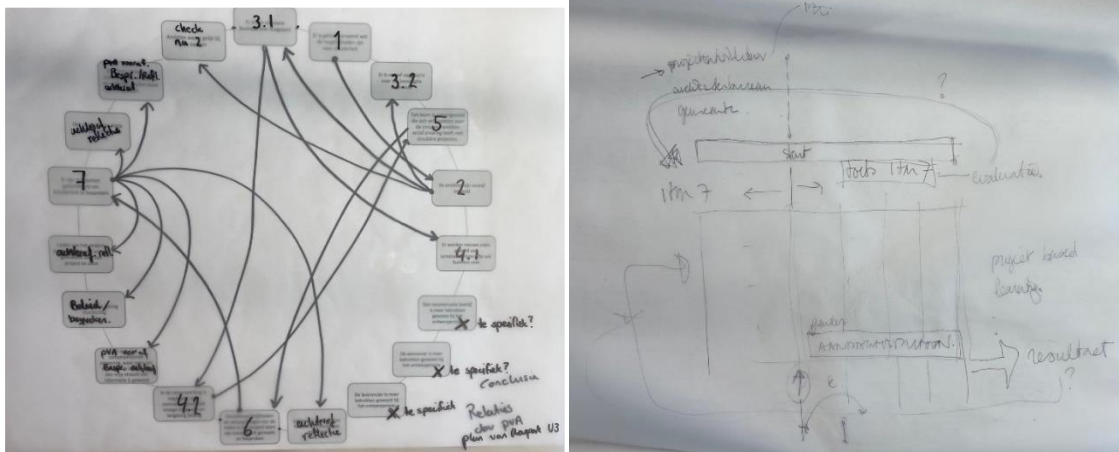
Section 1 - As preparation for the interview all checklist elements were put in a circle to be able to draw the relations easy. First the relations were discussed. I explained the thought process of finding the relations and mentioned that if anything should be added, the architect can enter. The definition of the 'relation' is that a certain element can only be checked if another is checked as well. For example, for creating a project team, first the required expertise must be determined. Otherwise selecting a team could be checked as done, but it would lack the required expertise and thus not be effective.

Section 2 - During the discussion, it became clear that with finding the relations a plan of actions was developing. Therefore, numbers of steps were added. With this, we realized that some elements were actions and others discussion points for evaluation in the process.

Section 3 - Building on this the architect drew the image as is shown on the right. The architect explained that the plan of actions should be discussed and handled before the start of the project, steps 1-7, see figure on the left. And that the remaining elements should be the checklist for evaluating during the process.

Report on interview consultant

Date: 13-4-2022

Time: 9:30-10:15

Attendees: Build consultant for sustainability

Section 1 - After a brief introduction on the research the interview started with the consultant describing the company he works at. In its origin the focus of company was on consulting circular tendering in the built environment, but this grew eventually into more services. When consulting, they make sure to have early integration of stakeholders and partners. The consultant emphasized on a different attitude that is required to transition towards a CE, but that this is still lacking in the built environment. This attitude consists of trust and transparency and making clear agreements for when things go well and wrong.

Section 2 - Within the organization they often refer to the IPF model: (Technische) inhoud, Process, Financieel, ((Technical) content, Process, Financial). The consultant mentions that in projects the (technical) content is often well organized, the process needs some improvements but is okay, but that the most problems come from the financial part. This is because, CE products are often more expensive, banks are less willing to finance circular projects as they are considered more riskier and the built environment has a lot of rules and policies on building ownerships, which makes negotiations on circular business models complex.

Section 3 - Another thing that often goes wrong, is that parties focus a lot on the technical aspect in their conversation. The consultant gives an example of an office place, requiring x amount of workplaces, this amount of lighting etc. He says that they must first talk about ambitions and from there see what they can built. After all this, I got the interest in if a circular business model is required or not. The consultant mentions that it is only a means, a good one, but that it should not be a goal on itself.

Section 4 - Then I asked when you start talking about a circular business model in the process. The consultant explained that first you need to define the ambitions. This provides answers to what materials and products are needed. Then you look for a way to finance it.

Section 5 - After this part of the interview I turned the conversation towards the tool and asked for advice. Five main things were discussed. First was that the checkpoints and a list of evaluation points are useful and that a lot of companies want these types of tools. However, and immediately the second point is that there is a risk that project teams see it a goal and not an means. Checkpoint reached and they forget about it. Therefore, third point, the consultant suggests to have this tool for a project leader or process manager as something to hold on to managing the process. Then they could stimulate the conversation and use the tool as a means. Fourth is that the consultant has experienced that people need more guidance than you think, formulating the checkpoints not as black and white could be helpful and thus adding a scale of satisfaction. But also making very clear what to do with the tool and for what it is used. At last the tender procedure is an important part of a building project. The consultant suggest to look for way to add this to the tool. After this we started talking on the vision, ambitions and ventures of the consultancy company and then I ended the interview.

Report on expert validation

Date: 10-5-2022

Time: 16:00-17:00

Attendees: Project leader construction projects and board member of architectural firm

Section 1 – I explained the development of the tool and asked if the two participants were able to read through the tool and see if they understand how the tool works. In their reaction they mentioned that the section of 'define the field' was missing something. Namely that it did not mention the step to research what circularity could mean for the client. There are situation in which the client does not have a circular objective and the other members of the project team (from the architectural firm) should take the initiative. Also the municipality could already set a frame work for circular ambitions, which are considered the administrative law. These should also be part of the section 'define the playing field'.

Section 2 – The tool should provide clear actions in the title of the sections. Define the playing field is a great example for such a title. This could provide clearer instructions for the user. Therefore it is suggested to leave the explanation from the process evaluation and add clear titles. Also create questions that trigger a reaction. They can be a bit tricky, but then it should be a great way to stimulate a conversation. It is mentioned that the questions for the evaluation are too generic/broad and can have too many different interpretations. A proposed trigger question is given: Did the openness or suggestions of team members have any contribution to the process? Also all elements should be written in present time, because action are not finished when you are in the project.

Section 3 – reading the section about flexibility and the business case, three elements can be distinguished, the first question is about time, the second about the quality and the third about money. Those three combined is the business case. Therefore it is suggested that the last question should focus more on the financial feasibility or financial requirements. Also the element of risks should be considered.

Section 4 – At last the experts mentioned that in the future partners as suppliers would already be part of the project team and questioned the use of the tool for then. Adding that the tool is, however, very useful for the phase in the transition we are in right now. In addition, the first and last checkpoint for the section of struggle of new roles, show overlap which creates the illusion of answering the same question twice. Then it was suggested to add a last question for the list of evaluation for the process, which was about if any of the set ambitions are reached ?

Tool V0

The budget can change in the way that different phases or actors are more involved. Therefore, the allocation of budget can change in regards of traditional projects

The planning can change because of different factors, see checklist. For circular projects, it is normal to see longer preparation phases and shorter construction phases

For circular projects, new expertise is required. We can see this in actors playing new roles or a shift in responsibility.

Existing roles that try to fill in new roles can cause actors to stick to the comfort of their old roles

For more flexibility, the client should provide room to maneuver

The budget changed, but without extra expenses

The planning changed, but without extra delays

New tender requirements are necessary for projects with circular ambitions

New expertise is required

This requires vulnerability of all actors

Actors within project teams need to stay vulnerable and accept that no one is an expert in the beginning of a project

Less directive roles

Being more open and sharing feelings and risks about the progress and completion of a project

no feeling to monitor actions of other actors

This translates in a general need for trust and transparency

Flexible allocation of budget

Integration deconstruction in preparation phase

New contract forms

New guarantees on building projects

Using new materials

New tender requirements were used in the project

The deconstruction firm gets more responsibility

The constructor works more as an architect

A collaborative environment

Actors could speak out there thoughts about the project

None to little monitoring required

Tool V1

Flexibiliteit kent uitingen in planning, budgettering en het ontwerpproces

- **Budgettering veranderd, zonder extra kosten** — Het budget kan veranderen door verandering in participatie, fases in het project en aparte budgetten voor het bewaken van de circulaire ambities
- **Planning is veranderd, maar zonder vertraging** — De planning kan veranderen door een langere voorbereiding fase die de ambities nodig hebben, denk aan inventariseren. Mogelijk wel weer korte bouwfase.
- **Ontwerpprocessen zijn belangrijk voor het proces en het uiteindelijk gebouw** — Het ontwerpproces kan flexibel ingericht worden door de toepassing van 'varianten denken'. Maar ook worden hier beslissingen gemaakt over de flexibiliteit van het gebouw

De zoektocht naar nieuwe rollen binnen het project team vraagt om een bewuste aanpak

- **Er is nieuwe expertise nodig** — Voor het bewaken en voltooien van de circulaire ambities is nieuwe expertise nodig. Zo ontstaan van nieuwe rollen binnen project teams. Dit kan vragen voor andere selectie procedures
- **Verschuiving van verantwoordelijkheid** — Bestaande rollen proberen de gaten aan te vullen door verantwoordelijkheden op zich te nemen en op andere momenten in het project aanwezig te zijn. Actoren kunnen terugvallen in oude gewoontes. Hierdoor is het belangrijk om verwachtingen duidelijk te maken en transparant te zijn over progressie

Vertrouwen en transparantie is nodig om veranderingen te bespreken en de ambities te beschermen

- **Kwetsbaarheid van actoren wordt gevraagd** — Actoren binnen het project team moeten zich kwetsbaar opstellen en accepteren dat niemand in het begin van een project de expert is.
- **Leiderschap meer gebaseerd op vertrouwen** — Een nieuwe vorm van leiderschap zorgt voor minder behoefte om te monitoren.
- **Meer openheid over de gevoelens betreft risico's en progressie van het project** — Actoren voelen zich vrij om zelf aan de bel te trekken als dit nodig is. Hierbij is het belangrijk om progressie goed bij te houden, denk toevoegen aan fase documenten.
- **Faciliteren van vertrouwen en transparantie** — Het faciliteren kan bereikt worden door vaste overleg momenten in te plannen en circulariteit op de agenda te zetten of zelfs geheel toewijden aan circulariteit
- **Circulaire uitstraling** — Elkaar wijzen op de circulaire ambities. Laten zien dat opdrachtgevers en andere stakeholders het projectteam kan vertrouwen om ambities waar te maken

Right column items:
- Budget geeft ruimte om te maneuvreren om ambities te bewaken
- Apart budget voor circulariteit
- Ambities vooraf bepaald
- Voorbereidingen gepleegd betreft circulaire mogelijkheden project
- Vooraf bepaald welke expertise er nodig zijn en of dit intern of extern opgelost kan worden
- Materiaal of installatie opties voor een flexibele bestek (varianten denken)
- Ontwerpen van flexibele plattegronden: multifunctioneel of functie wijziging in toekomst
- Installaties ontwerpen zodat het flexibel ingezet kan worden voor functiewijzigingen
- Flexibel programma van eisen kan het denken in varianten bevorderen
- Circulariteitspecialist toevoegen aan projectteam
- Installatie adviseur toevoegen aan projectteam
- Ervaringsdeskundige uitvoering circulaire bouwprojecten toevoegen aan project team
- Deconstructie bedrijven krijgen meer verantwoordelijkheid
- De aannemer werkt meer samen architect
- Er worden nieuwe eisen gesteld aan samenwerkingen en verantwoordelijkheden van rollen binnen het project team
- Bouwkundige verantwoordelijk voor circulaire installaties
- Architect verantwoordelijk voor materiaalkeuze en circulair PvE
- Actoren durven zich kwetsbaar op te stellen
- Een samenwerkende omgeving
- Geen tot weinig monitoring nodig
- Actoren voelen zich vrij om gevoelens over het project te uiten
- Momenten zijn gefaciliteerd om

Tool V2

Flexibiliteit kent uitingen in project processen en het vormgeven van de business case.

- **Een circulaire business case is gekozen**
  Een business case gericht op circulariteit kan flexibiliteit in het project stimuleren. Denk aan een andere manier van budgetering, investering en partnerships.
  - ☐ Er is een circulaire business case toegepast
  - ☐ Er is geïnventariseerd wat de mogelijkheden zijn voor circulariteit

- **Planning is veranderd, maar _zonder_ vertraging**
  De planning kan veranderen door een langere voorbereiding fase, denk aan inventariseren van mogelijkheden en expertise. Er is mogelijk wel weer een kortere bouwfase.
  - ☐ Er is vooraf nagedacht over de benodigde expertises
  - ☐ Een team is samengesteld die zich wilt inzetten voor de circulaire ambities en/of ervaring heeft met circulaire projecten.

- **Ontwerpprocessen zijn aangepast voor het behalen van circulaire ambities**
  Het ontwerp (proces) kan flexibel ingericht worden. Daarom is het belangrijk dat de ambities voor het project aan het begin al concreet zijn gemaakt.
  - ☐ De ambities zijn vooraf bepaald

De zoektocht naar nieuwe rollen binnen het project team vraagt om een bewuste aanpak

- **Er is nieuwe expertise nodig**
  Voor het bewaken en voltooien van de circulaire ambities is nieuwe expertise nodig. Zo ontstaan van nieuwe rollen binnen project teams. Dit kan vragen voor andere selectie procedures
  - ☐ Er worden nieuwe eisen gesteld aan samenwerkingen. _Zie ook business case_
  - ☐ Een reconstructie bedrijf is meer betrokken geweest bij het ontwerpproces

- **Er is verschuiving van verantwoordelijkheid**
  Bestaande rollen proberen de gaten aan te vullen door verantwoordelijkheden op zich te nemen en op andere momenten in het project aanwezig te zijn. Actoren kunnen terugvallen in oude gewoontes. Hierdoor is het belangrijk om verwachtingen duidelijk te maken en transparant te zijn over progressie
  - ☐ De aannemer is meer betrokken geweest bij het ontwerpproces
  - ☐ De leverancier is meer betrokken geweest bij het ontwerpproces
  - ☐ Verantwoordelijkheden en verwachtingen van de rollen in het project team zijn transparant gemaakt en besproken

Vertrouwen en transparantie is nodig om veranderingen te bespreken en de ambities te beschermen

- **Kwetsbaarheid van actoren wordt gevraagd**
  Leden van het project team moeten zich kwetsbaar opstellen en accepteren dat niemand in het begin van een project de expert is.
  - ☐ Leden van project team hebben zich kwetsbaar opgesteld

- **Leiderschap meer gebaseerd op vertrouwen**
  Een nieuwe vorm van leiderschap zorgt voor minder behoefte om te monitoren en is meer gebaseerd op vertrouwen.
  - ☐ Er was een samenwerkende omgeving, waar men van elkaar wilde leren en er een vrije stroom van informatie is geweest
  - ☐ Er was geen tot weinig monitoring

- **Meer openheid over de gevoelens betreft risico's en progressie van het project**
  Actoren voelen zich vrij om zelf aan de bel te trekken als dit nodig is. Hierbij is het belangrijk om progressie goed bij te houden, zoals circulariteit toevoegen aan fase documenten.
  - ☐ Leden van het project team voelden zich vrij om gevoelens over het project te uiten

- **Faciliteren van vertrouwen en transparantie**
  Het faciliteren kan bereikt worden door vaste overleg momenten in te plannen en circulariteit op de agenda te zetten of zelfs geheel toewijden aan circulariteit
  - ☐ Er zijn momenten gefaciliteerd om circulariteit te bespreken

- **Circulaire uitstraling**
  Elkaar wijzen op de circulaire ambities. Laten zien dat opdrachtgevers en andere stakeholders het projectteam kunnen vertrouwen in het waarmaken van de ambities
  - ☐ Het project team hielp elkaar om ambities te bewaken
  - ☐ Het team straalde uit naar stakeholders dat ze de ambities zouden waar maken

v2

Tool V3

Checkpoints (1)

Flexibiliteit kent uitingen in project processen en het vormgeven van de business case.

Een procesplanning dient flexibel ingericht te worden. Dit geeft de mogelijkheid voor langere voorbereidingsfases, denk aan inventariseren van mogelijkheden en expertises.

Er is een flexibele planning toegepast die rekening houdt met een langere voorbereidingsfase.

Er is vooraf geïnventariseerd wat de mogelijkheden zijn voor circulariteit.

Eisen dienen altijd terug te kunnen vallen op concrete ambities. Daarom moeten deze in de voorbereiding al geformuleerd worden.

De ambities zijn vooraf bepaald

Het toepassen van een circulaire business case kan naast het borgen van ambities ook zorgen voor flexibiliteit in het project. Bijvoorbeeld flexibele budgettering en financiering.

Er is een circulaire business case toegepast

De zoektocht naar nieuwe rollen binnen het project team vraagt om een bewuste aanpak.

Voor het bewaken en voltooien van de circulaire ambities is er nieuwe expertise nodig. Zo ontstaan nieuwe rollen binnen het project team. Dit kan vraagt voor andere selectie procedures van adviseurs en partners.

Er is vooraf nagedacht over de benodigde expertises

Er worden nieuwe eisen gesteld aan samenwerkingen

In de contractvorming is nagedacht over vroege integratie van partijen en het langdurig behouden van belangen aan het project

Uiteindelijk is er een team samengesteld dat voldoet aan de nieuwe gestelde eisen.

Vertrouwen en transparantie is nodig om veranderingen te bespreken en de ambities te beschermen.

Vertrouwen transparantie ontstaat door goede communicatie en aandacht. Dit moet gefaciliteerd worden in het proces. Dit kan doormiddel van circulariteit op de agenda te zetten tijdens overleggen of documentatie, zoals een fasedocument

Er zijn momenten gefaciliteerd om circulariteit te bespreken

Evaluatie punten (2)

Bestaande rollen proberen gaten van expertise in het project team aan te vullen door verantwoordelijkheid op zich te nemen en/of op andere momenten in het project aanwezig te zijn. Actoren kunnen hierbij terugvallen op oude gewoontes. Hierdoor is het belangrijk om verwachtingen van iedere rol duidelijk te maken en transparant te zijn over progressie van taken binnen het project.

Verantwoordelijkheden en verwachtingen van de rollen in het project team zijn transparant gemaakt en besproken.

Leden van het project team moeten zich kwetsbaar opstellen en accepteren dat niemand in het begin van een project de expert is.

Leden van project team hebben zich kwetsbaar opgesteld

Er was een samenwerkende omgeving, waar men van elkaar wilde leren en er een vrije stroom van informatie is geweest

Leden van het project team voelden zich vrij om gevoelens over het project te uiten

Een nieuwe vorm van leiderschap zorgt voor minder behoefte om te monitoren en is meer gebaseerd op vertrouwen op de expertise van het project team.

Er was geen tot weinig monitoring

Actoren voelen zich vrij om zelf aan de bel te trekken als dit nodig is. Hierbij is het belangrijk om progressie goed bij te houden en elkaar te wijzen op de circulaire ambities als de inzet dreigt weg te vagen. Dit laat ook zien dat opdrachtgevers en andere stakeholders het projectteam kunnen vertrouwen met het waarmaken van de circulaire ambities.

Het project team hielp elkaar om ambities te bewaken.

Het team straalde uit naar stakeholders dat ze de ambties waar gingen maken

V3

Tool V4

Checkpoints

Flexibiliteit kent uitingen in project processen en het vormgeven van de business case.

Een procesplanning dient flexibel ingericht te worden. Dit geeft de mogelijkheid voor langere voorbereidingsfases, denk aan inventariseren van mogelijkheden en expertises.

Er is een flexibele planning toegepast die rekening houdt met een langere voorbereidingsfase.

Er is vooraf geïnventariseerd wat de mogelijkheden zijn voor circulariteit.

Eisen dienen flexibel geformuleerd worden, maar dienen altijd terug te kunnen vallen op concrete ambities. Daarom moeten deze in de voorbereiding al geformuleerd worden.

De ambities zijn vooraf bepaald en voorzien de mogelijkheid voor flexibele eisen.

Het toepassen van een circulaire business case kan naast het borgen van ambities ook zorgen voor flexibiliteit in het project. Bijvoorbeeld flexibele budgettering en financiering.

Er is een circulaire business case toegepast

De zoektocht naar nieuwe rollen binnen het project team vraagt om een bewuste aanpak.

Voor het bewaken en voltooien van de circulaire ambities is er nieuwe expertise nodig. Zo ontstaan nieuwe rollen binnen het project team. Dit kan vraagt voor andere selectie procedures van adviseurs en partners.

Er is vooraf nagedacht over de benodigde expertises

Er worden nieuwe eisen gesteld aan samenwerkingen

In de contractvorming is nagedacht over vroege integratie van partijen en het langdurig behouden van belangen aan het project

Uiteindelijk is er een team samengesteld dat voldoet aan de nieuwe gestelde eisen.

Vertrouwen en transparantie is nodig om veranderingen te bespreken en de ambities te beschermen.

Vertrouwen transparantie ontstaat door goede communicatie en aandacht. Dit moet gefaciliteerd worden in het proces. Dit kan doormiddel van circulariteit op de agenda te zetten tijdens overleggen of documentatie, zoals een fasedocument

Er zijn momenten gefaciliteerd om circulariteit te bespreken

Evaluatie punten

Rating scale: Zeer matig — Onvoldoende — Voldoende — Ruim voldoende — Goed

Bestaande rollen proberen gaten expertise in het project team aan te vullen door verantwoordelijkheid op zich te nemen en/of op andere momenten in het project aanwezig te zijn. Actoren kunnen hierbij terugvallen op oude gewoontes. Hierdoor is het belangrijk om verwachtingen van iedere rol duidelijk te maken en transparant te zijn over progressie van taken binnen het project.

Verantwoordelijkheden en verwachtingen van de rollen in het project team zijn transparant gemaakt en besproken.

Leden van het project team moeten zich kwetsbaar opstellen en accepteren dat niemand in het begin van een project de expert is.

Leden van project team hebben zich kwetsbaar opgesteld

Er was een samenwerkende omgeving, waar men van elkaar wilde leren met een vrije stroom van informatie en waar eigen belangen geen negatief effect hebben gehad op de circulaire ambities

Leden van het project team voelden zich vrij om gevoelens over het project te uiten

Een nieuwe vorm van leiderschap zorgt voor minder behoefte om te monitoren en is meer gebaseerd op vertrouwen op de expertise van het project team.

Er was geen tot weinig monitoring.

Er was vertrouwen bij gemaakte keuzes door ieders expertise.

Actoren voelen zich vrij om zelf aan de bel te trekken als dit nodig is. Hierbij is het belangrijk om progressie goed bij te houden en elkaar te wijzen op de circulaire ambities als de inzet dreigt weg te vagen. Dit laat ook zien dat opdrachtgevers en andere stakeholders het projectteam kunnen vertrouwen met het waarmaken van de circulaire ambities.

Het project team hielp elkaar om ambities te bewaken.

Het team straalde uit naar stakeholders dat ze de ambities waar gingen maken

Tool V5

Onderzoek het speelveld

Bepaal of de beoogde teamleden openstaan om een circulair project te realiseren. Dit vraagt namelijk voor hogere inzet en meer flexibiliteit in hun rol. Onderzoek wat de mogelijkheden zijn en bepaal in welk tijdsbestek het project ontwikkeld kan worden.

Er is in overleg onderzocht of de beoogde teamleden gemotiveerd zijn en openstaan om een circulair project te ontwikkelen.
(Zeer matig) 1 2 3 4 5 (Goed)

Er is vooraf geïnventariseerd wat de mogelijkheden zijn voor circulariteit.
(Zeer matig) 1 2 3 4 5 (Goed)

Flexibiliteit kent uitingen in project processen en het vormgeven van de business case.

Een procesplanning dient flexibel ingericht te worden. Dit geeft de mogelijkheid voor langere voorbereidingsfases, denk aan inventariseren van mogelijkheden en expertises.

Er is een flexibele planning toegepast die rekening houdt met een langere voorbereidingsfase.
(Zeer matig) 1 2 3 4 5 (Goed)

Eisen dienen flexibel geformuleerd worden, maar dienen altijd terug te kunnen vallen op concrete ambities. Daarom moeten deze in de voorbereiding al geformuleerd worden.

De ambities zijn vooraf bepaald en voorzien de mogelijkheid voor flexibele eisen.
(Zeer matig) 1 2 3 4 5 (Goed)

Het toepassen van een circulaire business case kan naast het borgen van ambities ook zorgen voor flexibiliteit in het project. Bijvoorbeeld flexibele budgettering en financiering.

Circulaire business cases zijn onderzocht en er is overlegd over het gebruik er van.
(Zeer matig) 1 2 3 4 5 (Goed)

De zoektocht naar nieuwe rollen binnen het project team vraagt om een bewuste aanpak.

Voor het bewaken en voltooien van de circulaire ambities is er nieuwe expertise nodig. Zo ontstaan nieuwe rollen binnen het traditionele project team. Dit vraagt voor andere selectie procedures van adviseurs en partners. Ook kunnen nieuwe eisen gesteld worden.

Er is vooraf nagedacht over de benodigde expertises ter aanvulling van het project team.
(Zeer matig) 1 2 3 4 5 (Goed)

Er worden nieuwe eisen gesteld aan samenwerkingen met leveranciers, aannemers etc.
(Zeer matig) 1 2 3 4 5 (Goed)

Uiteindelijk is er een team samengesteld dat voldoet aan de nieuwe gestelde eisen.
(Zeer matig) 1 2 3 4 5 (Goed)

Vertrouwen en transparantie is nodig om veranderingen te bespreken en de ambities te beschermen.

Vertrouwen transparantie ontstaat door goede communicatie en aandacht. Dit moet gefaciliteerd worden in het proces. Dit kan doormiddel van circulariteit op de agenda te zetten tijdens overleggen of documentatie, zoals een fasedocument

Er zijn momenten gefaciliteerd om circulariteit te bespreken
(Zeer matig) 1 2 3 4 5 (Goed)

Beoordelingsschaal: Zeer matig — Onvoldoende — Voldoende — Ruim voldoende — Goed

Bestaande rollen proberen gaten van expertise in het project team aan te vullen door verantwoordelijkheid op zich te nemen en/of op andere momenten in het project aanwezig te zijn. Actoren kunnen hierbij terugvallen op oude gewoontes. Hierdoor is het belangrijk om verwachtingen van iedere rol duidelijk te maken en transparant te zijn over progressie van taken binnen het project.

Verantwoordelijkheden en verwachtingen van de rollen in het project team zijn transparant gemaakt en besproken gedurende het proces.

Leden van het project team moeten zich open opstellen en accepteren dat niemand in het begin van een project de expert is.

Leden van project team hebben zich meer open opgesteld

Er was een samenwerkende omgeving, waar men van elkaar wilde leren met een vrije stroom van informatie.

De circulaire ambities hadden de overhand over de persoonlijke ambities van partijen

Leden van het project team voelden zich vrij om gevoelens over het project te uiten

Een nieuwe vorm van leiderschap zorgt voor minder behoefte om te monitoren en is meer gebaseerd op vertrouwen op de expertise van het project team.

Leiding werd gegeven op basis van vertrouwen

Er was vertrouwen bij gemaakte keuzes door ieders expertise.

Actoren voelen zich vrij om zelf aan de bel te trekken als dit nodig is. Hierbij is het belangrijk om progressie goed bij te houden en elkaar te wijzen op de circulaire ambities als de inzet dreigt weg te vagen. Dit laat ook zien dat opdrachtgevers en andere stakeholders het projectteam kunnen vertrouwen met het waarmaken van de circulaire ambities.

Het project team hielp elkaar om ambities te bewaken.

Het team straalde uit naar stakeholders dat ze de ambities waar gingen maken

Tool V6

Checkpoints ①

Gebruik deze checkpoints ter evaluatie van de voorbereiding van het project

Onderzoek het speelveld

Bepaal of de beoogde teamleden openstaan om een circulair project te realiseren. Dit vraagt namelijk voor hogere inzet en meer flexibiliteit in hun rol. Onderzoek wat de mogelijkheden zijn en bepaal in welk tijdsbestek het project ontwikkeld kan worden.

Onderzoek en definieer samen wat circulariteit voor het project kan betekenen.
(Zeer matig) 1 2 3 4 5 (Goed)

Er is in overleg onderzocht of de beoogde teamleden gemotiveerd zijn en openstaan om een circulair project te ontwikkelen.
(Zeer matig) 1 2 3 4 5 (Goed)

Er is vooraf geïnventariseerd wat de mogelijkheden zijn voor circulariteit.
(Zeer matig) 1 2 3 4 5 (Goed)

Flexibiliteit kent uitingen in project processen en het vormgeven van de business case.

Een procesplanning dient flexibel ingericht te worden. Denk aan langere tijd voor inventariseren van mogelijkheden en expertises. Houd wel vast aan afgesproken deadlines.

Er is een flexibele planning toegepast die rekening houdt met een langere voorbereidingsfase.
(Zeer matig) 1 2 3 4 5 (Goed)

Ambities en eisen dienen concreet geformuleerd te worden, maar moeten ruimte geven voor een flexibele uitwerking. Daarom moeten de ambities en eisen in de voorbereiding van het project al geformuleerd worden.

De ambities zijn vooraf bepaald en voorzien de mogelijkheid voor flexibele uitwerkingen.
(Zeer matig) 1 2 3 4 5 (Goed)

Het vormgeven van een business case is belangrijk om ambities te borgen. Ook kan het zorgen voor flexibiliteit te zorgen door nieuwe manieren van budgettering en financiering.

Circulaire business cases zijn onderzocht en er is overlegd over het gebruik er van.
(Zeer matig) 1 2 3 4 5 (Goed)

De zoektocht naar nieuwe rollen binnen het project team vraagt om een bewuste aanpak.

Voor het bewaken en voltooien van de circulaire ambities is er nieuwe expertise nodig. Zo ontstaan nieuwe rollen binnen het traditionele project team. Dit vraagt voor andere selectie procedures van adviseurs en partners. Ook kunnen nieuwe eisen gesteld worden.

Er is vooraf nagedacht over de benodigde expertises ter aanvulling van het project team
(Zeer matig) 1 2 3 4 5 (Goed)

Er worden nieuwe eisen gesteld aan samenwerkingen met leveranciers, aannemers etc.
(Zeer matig) 1 2 3 4 5 (Goed)

Uiteindelijk is er een team samengesteld dat voldoet aan de nieuwe gestelde eisen.
(Zeer matig) 1 2 3 4 5 (Goed)

Vertrouwen en transparantie is nodig om veranderingen te bespreken en de ambities te beschermen.

Vertrouwen transparantie ontstaat door goede communicatie en aandacht. Dit moet gefaciliteerd worden in het proces. Dit kan doormiddel van circulariteit op de agenda te zetten tijdens overleggen of documentatie, zoals een fasedocument

Er zijn momenten gefaciliteerd om circulariteit te bespreken, zie evaluatie punten rechts
(Zeer matig) 1 2 3 4 5 (Goed)

Evaluatie punten ②

Gebruik deze evaluatie punten ter evaluatie van het process tijdens het project

	Zeer matig	Onvoldoende	Voldoende	Ruim voldoende	Goed

Bestaande rollen proberen gaten van expertise in het project team aan te vullen door verantwoordelijkheid op zich te nemen en/of op andere momenten in het project aanwezig te zijn. Actoren kunnen hierbij terugvallen op oude gewoontes. Hierdoor is het belangrijk om verwachtingen van iedere rol duidelijk te maken en transparant te zijn over progressie van taken binnen het project.

Verantwoordelijkheden en verwachtingen van de rollen in het project team zijn transparant gemaakt en besproken gedurende het proces.

Leden van het project team moeten zich open opstellen en met meerdere expertises samen werken om de circulaire ambities te behalen

Leden van project team hebben zich meer open opgesteld ten behoeve van de circulaire ambities.

Er was een samenwerkende omgeving, waar men van elkaar wilde leren met een vrije stroom van informatie.

De circulaire ambities hadden de overhand over de persoonlijke belangen van partijen

Leden van het project team voelden zich vrij om gevoelens over het project te uiten

Een nieuwe vorm van leiderschap stimuleert vertrouwen en transparantie en is daardoor gebaseerd op vertrouwen op de expertise van het project team.

Leiding werd gegeven op basis van vertrouwen
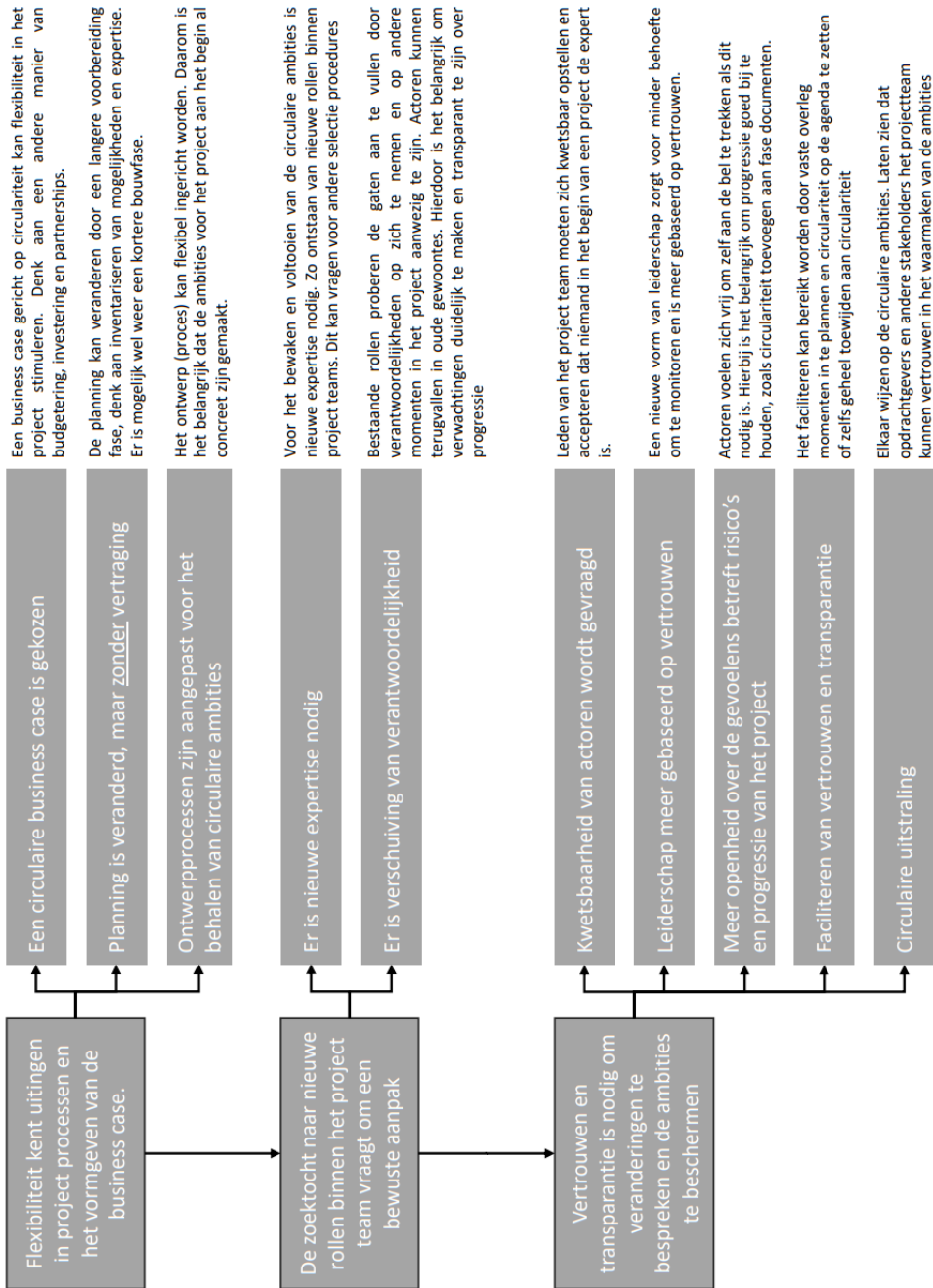
Er was vertrouwen bij gemaakte keuzes door ieders expertise.

Actoren voelen zich vrij om zelf aan de bel te trekken als dit nodig is. Hierbij is het belangrijk om progressie goed bij te houden en elkaar te wijzen op de circulaire ambities als de inzet dreigt weg te vagen. Dit laat ook zien dat opdrachtgevers en andere stakeholders het projectteam kunnen vertrouwen met het waarmaken van de circulaire ambities.

Het project team hielp elkaar om ambities te bewaken.

Het kan nuttig zijn om voor het volgende punt stakeholders te raadplegen.

Het team straalde uit naar stakeholders dat ze de ambities waar gingen maken

Tool VFinal

Checkpoints (1)

Use these checkpoints to evaluate the preparations of the project

Define the playing field

Determine if the intended members of the project are motivated to realize a circular project, because it will require additional effort and flexibility in their role, this also includes the client. Research the circular opportunities in the current market and administrative law and set a goal for the time frame of the project.

Examine through conversations if the intended members of the project team are motivated to realize a circular project
(This is done poorly)   1   2   3   4   5   (This is done well)

Research and define together what circularity could mean for the project
(This is done poorly)   1   2   3   4   5   (This is done well)

Research and inventorize circular opportunities in the market and administrative law
(This is done poorly)   1   2   3   4   5   (This is done well)

Develop a busines case that creates flexibility, quality and financial feasiblity

The process planning requires the opportunity for flexible interpretation between set deadlines. Longer preparation phases can be expected.

Make a flexible interpretation of the process planning possible, while taking the set deadlines and new risks, due to the circular objective of the project, into account.
(This is done poorly)   1   2   3   4   5   (This is done well)

Ambitions and requirements are made specific but provide the opportunity for flexible fulfillment. Therefore, ambitions and requirements should be formulated in the beginning of the project.

Formulate ambitions and requirements that provide the opportunity for flexible fulfillment beforehand.
(This is done poorly)   1   2   3   4   5   (This is done well)

The determination of financial requirements and allocation is important to secure circular ambitions. New types of business cases, specified for circularity, can be examined and evaluated for possible use.

Discuss and determine the financial requirements for the circular project
(This is done poorly)   1   2   3   4   5   (This is done well)

Seek new expertise and roles as addition to the project team

To protect and fulfil circular ambitions, additional expertise is often required in the project team. This asks for new selection procedures with new or other requirements for advisers, suppliers, contractors etc.

Think of new expertise and roles as addition to the project team beforehand
(This is done poorly)   1   2   3   4   5   (This is done well)

Determine new requirements for the collaboration with partners
(This is done poorly)   1   2   3   4   5   (This is done well)

Facilitate trust and transparency to discuss changes and protect ambitions

Trust and transparency grows through good communication and attention. This must be facilitated in the process, which can happen with documentation and making it part of regular meetings.

Facilitate moments to evaluate and discuss the process (see also the right half of this tool)
(This is done poorly)   1   2   3   4   5   (This is done well)

Evaluation points (2)

Use these evaluation points to evaluate the process of the project

Rating scale: Poorly — Adequate — Sufficient — More than sufficient — Well

Discuss expectations

Members in project teams can easily fall back to old habits instead of focusing on reaching circular ambitions. Therefore, expectations and responsibilities should be clear for each member in the project team.

Make expectations and responsibilities of team members transparent and discuss them among the team during the process

Be open about risk and progression of the project

Members of the project team should be open about the risks they see and the progression of the project. Also, they should be open to learn from other expertise.

Discuss risks and progression during the process to work transparently with all expertise

Create a free flow of information that members can access easily to learn from other expertise.

Make sure the circular ambitions overrule personal interests.

Take suggestions and concerns seriously when addressed by a member of the team

Be a trusting leader

A new form of leadership stimulates trust and transparency and is based on the trust in the expertise of project members

Use trust as a basis for leadership

Trust the expertise of members in the project teams when they make a decision

Stay on track to fulfil circular ambitions

It is important to keep track of the progress in regards of fulfilling the circular ambitions and to keep each other accountable if motivation is drifting away

Keep each other accountable for protecting the circular ambitions

It could be useful to discuss the following point with stakeholders.

Show stakeholders that the project team is capable of fulfilling circular ambitions successfully