
Collaboration Principles for Cascade Systems in a Regenerative Circular Economy

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Abstract: Cascades -a staircase model from high-quality applications to low(er)-quality applications- are an inherent part of the circular economy. Collaboration is recognized as key competency for implementing circular cascade design. By interviewing stakeholders at different phases in a collaboration, we explored collaboration principles in a cascade system. We conclude that collaboration principles require transparency, sharing and connecting. Partnerships start with an intrinsic motivation and a shared vision towards the regenerative circular system, using a holistic approach that puts humans and nature at its core. Learning collectively is important to do good as a system, in which the commonalities are trust and consciousness over suspicion. Co-creation over self-interest is important for sharing knowledge, resources, and materials. The individual business models of the partners become intertwined in a collaborative business model. Not one organisation is 'exclusively' in charge, a hybrid collective system is required: it alternates between specific contributions (own) and commonalities (together).

Keywords: Regenerative Circular Economy, Collaborative Business Models, Cascade Principles, Value Chain Collaboration, System Change

1 Introduction

The textile sector is the second most polluting sector in the world, after the gas and oil industries. Moreover, global production of clothing has doubled in the last 15 years. Clothing represents more than 60% of the total textile consumption in the world. The most widely used and best known renewable natural raw material for the Dutch textile industry is cotton. The current unsustainable production of cotton and textiles is exhausting the environment, due to use of artificial fertilizers and pesticides, large amounts of water consumption and high CO₂ emissions. In addition, cotton farmers worldwide but especially in the Global South are under pressure and end up in vicious cycles of debt because of rising costs and falling yields. At the other end of the chain, the useful life of clothing has become even shorter. In the Netherlands, 60 percent of the discarded textiles end up in residual waste streams where they are burned. Of the collected textile, approximately half is suitable to be worn again, the rest are processed into low-value applications (like cleaning rags or isolation material) and are ultimately incinerated (Van der Wal and Verrips, 2019). Both the economic and sustainable improvement potential for making longer use of textiles that are already in circulation is therefore enormous. However, in common recycling, the quality of cotton declines with every (mechanical) recycling, because the fibre length becomes increasingly shorter. The challenge is to recycle several times, retaining or even creating value in each recycling step. Following the Cradle to Cradle® design framework, the ultimate goal is to return the raw materials safely to the biosphere as nutrition for the soil after which a new cascade can begin: a cycle in the form of regenerative cascades.

Regenerative design is about asking yourself how many different forms of added value can be created for multiple parties (Raworth, 2017). Designing according to these principles can bring about a paradigm shift. This involves the transition from the linear, degenerative, take-make-waste economy to a regenerative, circular economy, focused on closing the resource loop and recovery. Few organizations can independently close a complete loop. Companies need to work together to establish a sustainable value system. Many organizations are struggling to adapt their existing business model or create new circular business models (Bocken et al., 2015). Our research investigates collaboration principles for a cascade system by designing collaborative business models in the transition towards a regenerative circular economy. This includes companies not only focusing on their own financial gains, but also considering the optimization of the entire system, aiming at a positive ecological and social impact.

2 Theoretical framework

Circular economy

The transition to a circular economy is one of the necessary conditions to reach prosperity while protecting a live-able earth now and later (WCED, 1987). This concept is recognised by both academics and practitioners as a proposition to face today's societal, economic and

environmental challenges. According to McKinsey (2017), circular economy means creating 'a reliable way for industries to increase their profitability while reducing their dependence on natural resources'. Circular economy is defined as an economic and industrial system 'where material loops are slowed and closed, and where value creation is aimed for at every chain in the system' (EllenMacArthurFoundation, 2015). Circular systems ensure a constant flow of services and goods without the need for new materials or raw materials, through different 'value circles' (EllenMacArthurFoundation, 2017; Jonker et al., 2018). A distinction is made here between the biological-cycle (e.g., cotton, wood) and the technical-cycle (e.g., plastics, metals). This was depicted by the EllenMacArthurFoundation (2015) in the well-known "butterfly diagram".

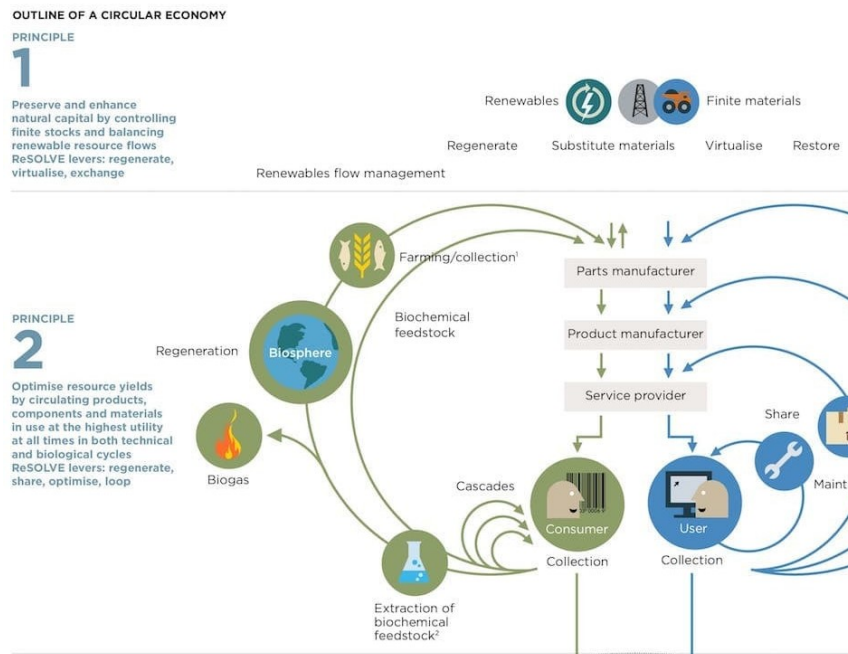


Figure 1 The "Butterfly diagram" source: Ellen MacArthur Foundation (2015)

The Cradle to Cradle® design framework, focuses on systems being restorative and regenerative by design (McDonough & Braungart, 2010). This can be in terms of materials, products, systems, and business models, in such way that they aim at reducing waste by focusing on restoration, reusing, and renewing (EllenMacArthurFoundation, 2013). Circular systems therefore always include efforts to optimize the use of raw materials, by reducing raw material use, reusing products and components, or recycling raw materials (Kirchherr et al., 2017). This repeated use of raw materials results in maximising reusability and minimising value destruction. For this, radical and systemic innovation is needed on the technical level as well as on the organisational level.

Cascading

Cascades represent a specific approach to the circular economy (EllenMacArthurFoundation, 2013; 2017), which focusses on an innovative value system of resource management, aiming at extending product use-time and closing material cycles (Mair & Stern, 2017). Cascading is based on the principle of resource sequentially by using a material in multiple phases for different goals (Winans et al., 2017). Consumption may take place in this cycle (fertilisation, food, water) as long as the flows are not contaminated with toxic substances and ecosystems are not overloaded (EllenMacArthurFoundation, 2015; McDonough and Braungart, 2002). The power of the cascade refers to the 'diversification of reuse in the value chain' (WorldEconomicForum, 2014). During reuse, the quality of the material decreases. When the initial function of a product or material can no longer be fulfilled, the transformation (e.g. through recycling) to the next step in the cascade can take place.

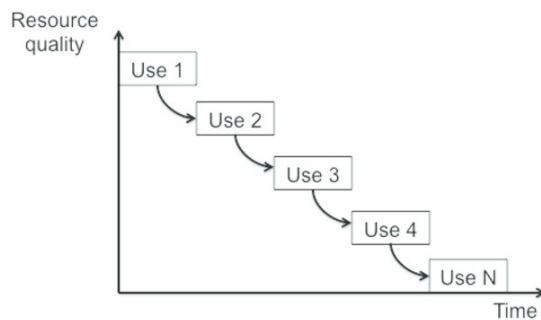


Figure 2 Sequential utilization of resources (Sirkin, & Van Houten, 1994)

Therefore, recycling within the biological-cycle may occur in the form of regenerative cascades: a staircase model from high-quality applications to low(er)-quality applications as a result of (mechanical) recycling and unavoidable quality loss, in which the products and material can ultimately safely return to the biosphere as a nutrient (Mair, & Stern, 2017; Sirkin, & Van Houten, 1994). Cascades, even though they are an inherent part of the circular economy, are not yet widely practiced and/or thoroughly understood.

Inter-organizational collaboration

Collaboration is recognized as key competency for implementing a circular design (Sumter et al, 2020). Brown et al., (2019) indicate that a high level of collaboration supports more system innovation. Collaboration has a lot of benefits, like increasing knowledge flows, better access to resources and new markets, sharing risks, possibly bigger market share and more competitive advantage. This all could lead to better company performance. Collaboration is also needed to exchange materials because within a circular economy one company's waste is another company's input (Pinheiro et al., 2018). But on the other hand, there are disadvantages to collaborations such as loss of control, opportunistic behaviour, and trust issues (Brown et al., 2019).

Innovation processes create more leverage for change than other processes within the organisation. These innovation processes need to outreach collaboration in a chain, it requires decisive and conscious sharing of resources and risks by all stakeholders, and transparency and trust are essential (Janssen and Stel, 2018). Inter-organizational collaboration is needed to create new business models which focus on closing the loops. This means that extending the resource's lifecycle is possible when different actors in a production chain collaborate. This way of collaboration is considered to be a key element in closing the loops and therefore critical for realizing a circular economy (Bocken et al., 2016). It is important to include all stakeholders when aiming to close loops (Korhonen et al., 2018).

Collaborative business models

Circular business models are networked by nature: they require collaboration, communication and coordination within complex networks of various and different actors and stakeholders (Antikainen & Valkokari, 2016). By working together and truly joining forces, companies in the value system can increase their positive impact for all actors, society and the environment. Communities are formed in which knowledge and ideas can be shared, exchanged and created (Jonker et al., 2018). Organizations need to reconsider how they maximise multiple values in product design and use of materials to decrease the usage of natural resources and create sustainable impact (Kraaijenhagen et al., 2016). For this, business models need to be shaped by different actors as a collective endeavour, referred to as collaborative business model. The collaborative nature of a business model means that both for the network as well as for the different stakeholders, the business model must create added value (Kraaijenbrink et al., 2019). In these collaboration-based business models, it is important that the value range includes the full spectrum of activities, carried out by different stakeholders, since the product continually circulates and creates value in the system (Rohrbeck et al., 2013; Fogarassy & Finger, 2020). Collaborative business modelling is a process in which parties jointly examine whether their partnership can create multiple value and design on a business model, or logic, by which the partnership wants to create value. It shows what the participating partners do, what matters for whom, what it takes to realise that and what yields are gained. Many organisations struggle to adapt their existing business model or create new circular business models (Bocken et al., 2015; Antikainen and Valkokari, 2016). The concept of collaborative business model development seems very promising, but more research is needed to operationalise it. Bocken et al., (2021) emphasize the need for deeper analysis within disciplines, as well as the need for trans-disciplinary experimentation with circular business models. To move towards a regenerative cascade, several new principles of entrepreneurship need to be developed. These collaboration principles include other ways of working, organizing, doing business, earning, collaborating, and creating value. This means that organizations have to 'rethink' how they organise their business, which involves a movement towards an economy that no longer sees humans and nature as a resource, but as a partner in creating well-being for everyone in harmony with the earth (Spaas, 2020). We explored the innovative collaboration principles of collaborative business models in a cascade system.

3 Method

Research design

The current literature on cascading and collaborative business models is still limited. An explorative case study approach is chosen to gain insight into these new concepts that are still explorative and not looked into that much (Symon, & Cassell, 2012). We used a case study approach with semi-structured interviews since this provides the opportunity to ask 'why'- and 'how'- questions and get a thorough and in-depth overview of a situation. We organized two rounds of semi-structured interviews with six partners of a research consortium (farmer supporting organization, textile producers and recyclers) to explore how they collaborate. On a small, but intensive and in-depth scale, we discussed which aspects these stakeholders considered important directly at the start of the project and again six months after the start. In these six months, we organized five online workshops on different themes (cascading, logistics & transparency, values & impact, business modelling) to gain more insights into their roles, influences and decision-making criteria, while drawing the cascade using a design research approach ('doing', 'harvesting what goes well' and 'developing and shaping'). Interviews and workshops were recorded, transcribed and coded for exploring the business principles, using the four building blocks of supply chain collaboration.

Case: circular cotton cascade

This research is part of a two-year project (raak.mkb13.020), in which Dutch companies (especially SMEs) from the entire textile chain are working together with Indian companies to design and record the process of a regenerative, circular system in which cotton is reused multiple times before it finally returns safely to the biosphere. Together with Avans University of Applied Sciences, the consortium is exploring and designing collaborative business model scenarios for this cascade system. The cascade starts with virgin cotton and continues in the following applications: workwear, T-shirt, hand towel and landscape fabric, to ultimately return safely to the biosphere. The focus is both on research into the technical feasibility of the cotton fibre and on the development of collaborative business models.

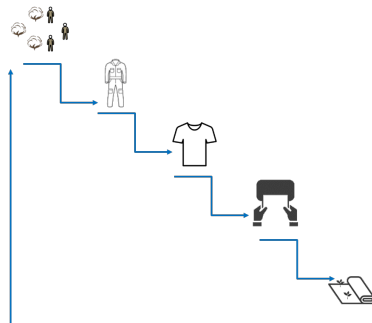


Figure 3 Circular Cotton Cascade

Tool for Supply Chain Collaboration

Leising et al., (2018) have developed a conceptual framework for studying circularity in supply chain collaboration in the construction environment, using the four building blocks: (I) future vision, (II) Joint Learning, (III) Network Dynamics and (IV) Business Model. Our findings have been categorised according to the conceptual framework for circular economy in chain collaboration (Leising et al., 2018) that has been elaborated into a steppingstone tool for the design of collaborative business models (Janssen et al., 2020).

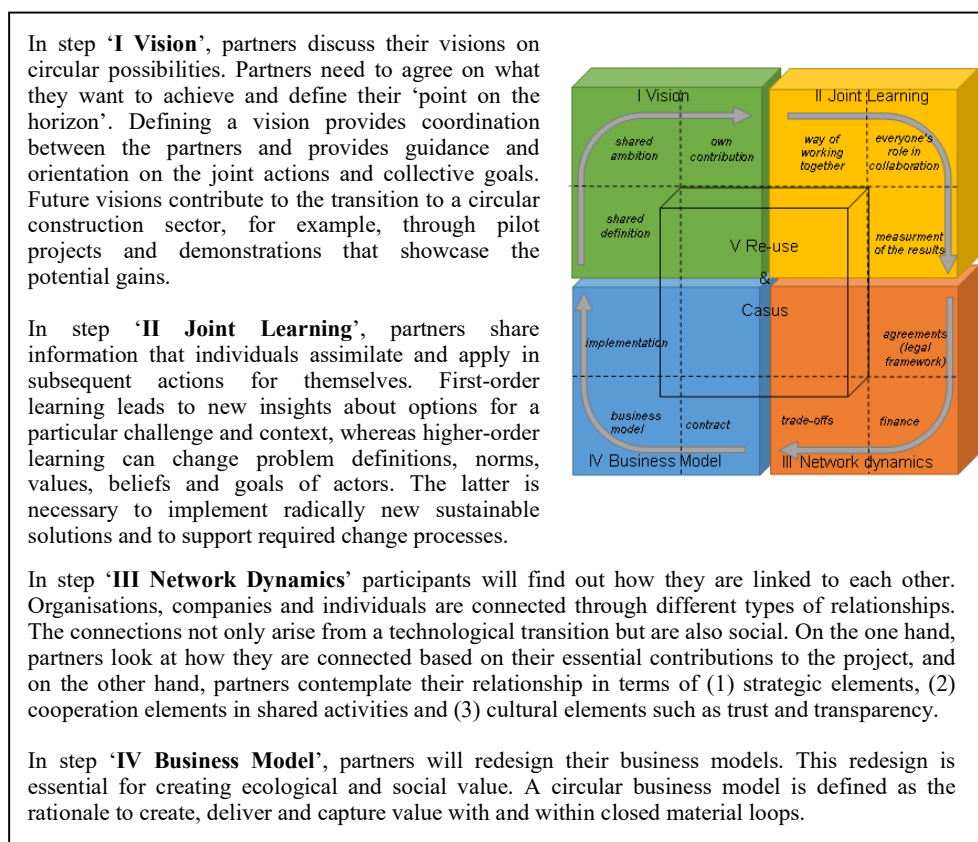


Figure 4. A steppingstone tool for Collaborative Business Models (Janssen et al., 2020)

4 Findings

Circular economy and Cascading

In a collaboration, it is important that the partners have the same understanding of the concepts they are working on. Respondents were asked to define 'Circular Economy' and 'Cascading'. In the first round of interviews, respondents defined circular economy based on concepts including '*reusing or recycling products that have reached their end-of-life, in the same functionalities*', '*moving away from linear to repeated use*' and '*waste becomes a new raw material, in order to reduce the production of new materials*'. The respondents indicated that the term cascading was new to them and was still rather vague to them: '*it has to do with multiple recycling*'. They explained that cotton fibres are being affected by use (wearing) and recycling (tearing) and that the quality of the material decreased when using it. They also explained that different products ask for a different quality standard of the fibre and that cascading is about adjusting the value and application accordingly. All respondents indicated that cascades are therefore about quality: '*what chain can we invent and build from the material, to use the raw material for a new end product with a lower quality, instead of throwing it away?*'.

In the second round of interviews, the concept of circular economy was described in more detail and was much more aligned between the partners. Almost all partners included the role of design in their definitions: '*infinite cycle of material in which everything is raw material for a new product; according to Cradle to Cradle® design, there is no waste*'. In addition, they all used elements related to a journey of the raw material in a flow in which it is used in various forms related to the '*end-of-use*' of the material in different forms of application. Respondents indicate that they have to explore if they need to '*influence usage time in order to find the highest value of products in the cascade in relation to quality*'. Respondents also empathised that cascading therefore has to do with '*collaboration*'. Together they need to look at possibilities by asking each other questions about the 2nd and 3rd processing step in a much more advanced way: '*I have the feeling that companies are looking at the bigger picture, it is challenging but it can be done*'. Respondents stress the importance of doing it together, beyond a spear of loops, and tune in to details: '*humans interact as businesses, they go in diverging directions, need to figure out a way to realign to a new economy*'. Respondents also addressed the technical challenges in the cascade. They explicitly addressed the need for transparency to assure that '*the cotton is really the cascade fibre that is going around in the system*' and question if this fibre needs to be blending with other grades to get the best products, like blending short and long fibres to pick up the quality standards.

System innovation

In the first round, respondents indicated that the current non-sustainable production of cotton, the soil and the cotton plants are intensively exposed to chemicals and pesticides. Respondents acknowledged that the system is not acceptable because of exploitation and power disbalance in the chain. They indicate that the system needs to innovate to a more

conscious one about the material, the production and processing, the equality in the chain in relation to value creation. Consumers need to respect and value cotton fibres more and become aware that textile is not a disposable product.

In the second round, respondents indicate the last step as being the most innovative. The material is still of high-quality value. The partnership is working towards something that can be put into the ground that does not yet exist and created additional added value for what a material can do there: *'the landscape fabric can also be a carrier of fertilisers, prevent weed growth, cope with weather conditions, retain water, reflect the sun'*. Next to the technological feasibility of the material based on quality, the collaboration is also indicated as innovative. Partners refer to the challenge but also in cooperation between partners. Everyone functions on their own, but the challenge is to link everyone to each other: *'companies often work in a black box, where everything is shielded, and here, the anonymity has to come out, and it has to be open and transparent'*.

Vision

The partnership started working together on textile recycling, with the ambition to help the sector move forward. The initiator of this concept (Dutch SME Yassasree B.V.) put the various pieces of the puzzle together, while having a good picture of what the partners were doing and proposed to work together on something concrete, like this cotton cascade. Participants indicated that they wanted to learn how to preserve the quality of products as long as possible. They were curious about learning what the partners in the cooperation are up against and how to deal with challenges that arise. Respondents share a motivation to change, since they all have seen poor working conditions and bad environmental impact. They all share the intention to be better in the triple top line of social, ecological and economical value creation. In addition, they strive to make an impact by changing behaviour, creating awareness that 'waste' can be used in different loops and showcasing that it actually can be done. Respondents indicate that for passing on these multiple values, collaboration is necessary. Here they refer to the main challenge of a cascade system: *'how to manage the logistics moving across the different layers of the cascade and how manage and align the desires and the needs?'*. Respondents know that they are still individual business that aim to co-create in a harmonised working relationship. They recognize that they need collective thinking in how they are dealing with this new concept, including a lot of uncertainties and assumptions, at a rather rigorous pragmatic way.

After half a year, respondents elaborated more on the concept of collaboration and multiple value creation. They realised that it is more than the sum of its parts and that it is more about orchestrating the whole system. Although the concept becomes clearer, the concept also cranks up questions on the *how*. They gained more insights in innovative ways to move from a linear to a circular economy by learning about the possibilities and how to connect to others while making a positive impact. They honour the variety: *'it was an eye-opener that some look differently at things or use a different approach to challenges'*. The partners realised that each partner is at a different point in the transition to a circular economy: *'some partners have great ideas that further sprouts, people observe and embrace those pioneers to learn'*. Respondents feel that it is important to increase the magnitude by

learning and developing. They created awareness of sustainability in their own organization by explaining the concept and picked up topics outside the project to improve their own business, but also to set an example for the industry. The partnership aims to showcase the importance of collaboration for the long term with multiple players.

Actor learning

At the start, respondents expected that knowledge sharing in a cascade will exceed normal collaboration. Although the project proposal looked solid, it all depends on the way partners are working together and the level of trust: *'we start with a good basis of trust, which need to grow further'*. The respondents indicate that it is important that the partners communicate with each other in a transparent manner and that they respect each other in order to maintain a good level of trust for sharing knowledge. Respondents indicate that they have to learn from each other on design and materiality for re-use.

After six months, respondents indicated that they learned a lot from sharing experiences with each other. They gained more clarity on the roles and strategies of the other partners. Some respondents indicated that they now realised that quality is an extra dimension for connecting to each other: *'we are learning on standards, and we now raised the bar'*. For others, the learning could be approached more radically in designing the innovation: *'we could have moved faster, but it takes time to align, we know that we now can be more effective, we are grateful and ambitious'*. Respondents still see a challenge in cooperation as the cascade is quite ambitious and priorities need to be aligned. For this, the partnership should not ask for guarantees, but give space to fail and learn. They stress the importance of feeling the connection and providing feedback. During the collaboration, partners shared experiences and content knowledge to gain insights into each other's companies and processes and realise the importance of commitment, involvement and ownership in the cascade: *'I think, we can always find a way around technology, but I am curious about how to achieve an equivalent cooperation'*.

Network dynamics

At start, respondents indicate that cascade systems include enormous dependencies in supply and demand related to the position and role in the system. They point out that trust and respect are important for knowledge sharing. Partners have to find out to what extent they are *'going to share the recipe and give each other insight into their kitchen'*. Some refer to the challenge of balancing between open and exclusive data and protecting information while bringing the cascade a step further. They indicate that it is important to have contracts to define what is confidential and what information can be commonly shared. Partners have the intention to draw up an agreement about how they want to work together by simple norms and values, based on the principles of conscious contracting. In the partnership agreement, the contributions in hours and money are fixed, but details on how to deal with trust still needed to be worked out: *'what happens if someone does not comply, or runs off with money or knowledge?'*. Respondents indicated that they need to balance between control mechanisms and alignment by forcing each other to be open and transparent about sharing risks, profit goals and motivations. They think that this will further increase the level of trust and lowers

the need to control, since negativity grows from distrust. Furthermore, they have dependencies with partners outside the project. They feel that it is important to create a level of involvement with their customers as well. Challenges refer to meeting the quality standards further down in the cascade: *'requirements are set for input streams and one of the biggest challenge is to match expectations on quality of fibre'* and to tracking and tracing the product during its journey. Respondents indicate that it is important that dedicated partners support the system in an overall cooperation.

After half a year, respondents indicate again that everyone has a crucial role in participation and that collaboration is crucial: *'we have a mix of companies, and we need to work with the capacity and boundaries of each other'*. Some respondents emphasised the importance of interpretation and nuances: *'we are on the verge of sharing details: what value and impact we can make is determined by making choices'*. Respondents indicate that it helped to do exercises to get out of comfort zones and to take small steps when making it more concrete for own business. They acknowledge that honest sharing of challenges can help make them more tangible and contribute to collectively solving them. In this respect, respondents also refer to the role of government that need to set circular requirements to products (e.g. amount of recycled material) and the Extended Producer Responsibility (EPR). This means that textile producers become responsible for the collection, sorting, recycling and waste processing of products they bring onto the Dutch market. Moreover, respondents indicated that they have a quite good connection to the other partners, since they all share the same intension. Partners are open for cross-communication about experiences and feel confidence that sharing is good: *'making it concrete helps in understanding how it could be done, what we encounter'*. At the same time, some respondents indicated that it might take more energy to start really working together. They indicated that they are prepared to share more details and be open to changing possible steps in the current process. Some respondents also indicated that parallel collaborations arose on textile flows outside this cascade. Partners are learning more about the input streams of the others or technical requirements of the end products. Respondents specified the need to clearly communicate about expectations of the end product. Partners have to formulate concrete boundaries on this: *'we need to set go and no-goes, what do we find important and what do we agree on?'* Trust in this is complex. Partners wish to protect aspects, but at the same time they know they need each other to make it happen. They feel that promoting honesty in expectations contributes to empathy and open behaviour in an ethical way.

Business model

Respondents were asked to describe the value proposition at the start of the project: *'value is created in different steps in the cascade, each step has a unique value that we want to deliver to the customers'*. Next to that, they referred to aspects like: *'focussing on being less mean to nature, less waste, less negative impact but creating positive impact'*. Respondents indicate at the same time that the biggest challenge is collaborating in a co-creating system: *'it's about cooperation: looking forward and backward, we don't throw things from one to another'*. Respondents stressed the importance of achieve the common goal by thinking and acting in terms of the collective instead of the individual. Respondents highlighted they need to go

beyond everyone doing their own thing, they approached it as a win-win-win leading to advancing the development and moving these processes from exception to the rule: *'it is in its cradle, everything is possible, but at the same time, nothing is possible.*

Another part of the value proposition focuses on the wish to tell the story of the cascade, as a conscious process with efficient use of material, leading to a positive impact on human and nature, both at the beginning as well as at the end of the chain. By sharing the narrative, respondents intend to inspire others in the textile sector and also others in other sectors. For this, they indicate that the narrative needs to be shared in a simple way, not in technical jargon to make it understandable for everyone.

In relation to multiple value creation, respondents indicate the triple top line to be important at all levels: (1) ecological, such as not working with toxic material, (2) social, like equally paying attention to all partners and respecting cultural aspects and (3) economical, like a fair distribution. Related to this allocation of investments and return on investments, the respondents indicate that they have not thought about that. They mainly want to learn: *'this project is for learning, not for earning'*. When thinking about an allocation key, some respondents think about putting all the ingredients together, make the cake and then divide it in pieces, based on transparency per recycling step: *'we have to look at the basics; what is happening, who has risks, what responsibilities, resources, intellectual value and bring it all to the table'*. They indicate the need to brainstorm about what is acceptable.

After half a year, respondents further specified the value proposition as *'offering controlled material flows through all layers of diverging products'*. They referred to the system that brings four products to the market in a fully circular manner, by a supply chain that is taken responsibility, starting with farming conditions and taking care of the soil in India, towards collaborating to connect 'end of use' products from different qualities in an extended loop. Respondents also included elements related to backwards and forwards control. They realised that the value proposition is larger than the business perspective: *'we think of new BM with a broader range of stakeholders, including a layer of 2nd stakeholders and stakeholder beyond human'*. Respondents again stressed that collaboration is key to making it work: *'we are far away from the end-user, and those are the ones that we are doing it for, but there are many links in between that. We need how to get to the end consumer, here is what can increase it'*. In this system, the respondents addressed that is it about a collective system, in which each partner is having its own value proposition which is enlarged by the added value of the cascade: *'we draw the cascade from the I to the We, the added value is in the collaboration'*. Some respondents also indicate that a partner universe and impact matrix can contribute to how to allocate investments and return on investments: *'in an Utopian world, we put all value on the table at a fair and transparent way, and make an equitability distribution'*. Others think that they have to divide sales, according to a fair allocation key among the 4 steps of the cascade, in which the added value can be included as flexible distribution key. Respondents all think that it will be a difficult process since what is good, fair or acceptable might be different for everyone.

5 Conclusion and discussion

Collaboration principles

Cascading is based on the principle of resource sequentially by using a material in multiple phases for different goals. Designing according to these principles can bring about a paradigm shift. This involves the transition from the linear, degenerative, take-make-waste economy to a regenerative, circular economy, focused on closing the resource loop and recovery. We investigated collaboration principles for a cascade system by designing collaborative business models in the transition towards a regenerative circular economy.

Holistic approach

The cotton cascade aims at re-using and recycling from the onset, starting with regenerative cotton production. Regenerative agriculture goes beyond “less bad” and focuses, inspired by nature, on how to regenerate, restore and nurture. Regenerative cotton often goes beyond organic cotton practices and turns cotton, often seen as a culprit, into a driver of positive impact. An intrinsic motivation and shared vision to this closed loop system in which the raw material is ultimately given back to the soil is important. A holistic approach to agricultural systems puts humans and nature at its core.

Organising the collaboration

The partnership started to work together from the perspective to learn about technologies and applications to develop a sequence of re-using materials in different applications in a cascade system. While working together, the learning perspective moved to learning about how to organise the supply chain and the collaboration. Collaboration is seen as a necessity but also as the greatest challenge.

Collective learning

The network consists of a co-creating system in which the commonalities are trust and consciousness over suspicion. The stakeholders aim to learn collectively to do good as a system. Creating an open and transparent environment, with a good basis of trust, is important for sharing knowledge, resources, and materials. A linear economy is purely transactional., for the cascade the entrepreneurial attitude is different. Specifically, when aspects are not sure, it is important to not give up. Regularly discussing and aligning expectations contributes to overcoming challenges. New and innovative ideas can be discovered during open brainstorming, with actors in their own supply chain, but also with other actors outside the partnership. A supportive network is needed to realise the cascades.

Mapping the partner universe

In a circular cascade system, everything is a resource for something else. Mapping the partners' universe contributes to defining dependencies and identifying inputs and outputs to realise a controlled downcycle process and define leakages. Knowing your partners contributes to acquiring new information to extend viewpoints create new knowledge, and

also to acquire new resources and materials. NGOs and government need to be involved to set up a broader system. This also includes also to give a voice to non-human stakeholders through representatives to check whether it is also positive for them.

Positive impact

By visualising all impacts, systems move away from an anonymous chain. Dependencies become a positive force to create a positive impact on the triple top line of sustainability: ecological, economic, and social. At the ecological level learning to respect the processing of the raw material is important. At the social level, allowing regenerative agriculture contributes to pioneering how to take better care of the land and to respecting and valuing farmer communities.

Balance between control mechanisms and openly sharing

Mentioned multiple times, a basis of trust is crucial in collaboration. This trust originates from previous experiences or from openly sharing expectations and being honest about intentions from the start. Nevertheless, still, agreements or contracts with clear statements on specific aspects of ownership are desirable to protect exclusive or confidential information. In innovative collaboration, partners always have to fear that ideas are shamelessly taken and question how to deal with protection. It appears to be important to articulate concerns and define the boundaries. Partners need to set the do's and don'ts in an open and empathic process based on shared ethics.

Intertwined business models

In a cascade system, the individual business models of the different stakeholders become intertwined in a collaborative business model. This means that choices made in different parts of the system have a direct or indirect effect on all involved in the system. In this, it is a challenge to allocate investments and returns on investments. Brainstorm about a fair allocation key, in which the added value is included as flexible distribution key, contributes to developing a fair system. This is a difficult process since what is good, fair or acceptable might be different for everyone. The importance of organising a balanced distribution of multiple value creation for all actors in the system is also stressed by Kirton et al. (2014). However, if a partnership manages to achieve a balanced allocation of resources, opportunities, basic needs and usage and property rights (Valente, 2012) collaborative business models are more likely to be viable and remain robust.

Collective system

In sum, business principles for a cascade system require transparency, sharing and connecting. Trust over suspicion. Co-creation over self-interest. Pre-competitive collaboration agreements are an important part of this. To create value in these areas, not one organisation is 'exclusively' in charge, but cooperation in a system is required. The collective system is hybrid: it alternates between specific contributions (own) and communalities (together).

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