

B2B Customer Value Co-Creation for Sustainable Machinery in the Food Processing Industry

A Case Study from The Netherlands

Devrim Eskiyeerli

d.eskiyerli@fontys.nl

Fontys University of Applied Sciences, Research Group Business Innovation
Venlo, The Netherlands

Gunnar Schmid

gunnar.schmid.0110@gmail.com

Fontys University of Applied Sciences, Research Group Business Innovation
Venlo, The Netherlands

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Abstract – This study examines customer-centric vision and sustainable value co-creation in the B2B machine manufacturing industry. It uses a generative approach to explore B2B customer expectations, focusing on co-conception and co-design. Our research aims to integrate customer-centric benefits with sustainability goals through sustainable business models and boundary work theory. In our paper, we examine a growing circular firm in the food processing machinery sector in The Netherlands. Our study is guided by the main research question, "What actions do B2B customers expect for enhanced machinery sustainability?". We implemented a single case study and a collaborative research framework, integrating business viewpoints to enhance theoretical contributions within a qualitative mixed-method approach. Our findings indicate that, reduction and repurposing of water and used water, and machines generating less food waste and processing waste are among the top expectations of the B2B customers. B2B contexts are underrepresented in customer co-creation literature, therefore our paper contributes with empirical findings to this field.

Keywords – Customer Co-Creation, Sustainable Co-Creation, Sustainable Machinery, Growing Circular Firms, Customer Centric Enterprises, B2B Co-Creation

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1 Introduction

In the current dynamic business setting, enterprises face challenges to maintain their competitiveness and outperform their rivals. Sustaining high business performance presents challenges that demand constant adaptation and innovation. For remaining competitive in this volatile environment, businesses are required to rethink their strategies and operational frameworks. The key to success lies in continuous adaptation and innovative thinking. Innovative mindset is particularly pronounced in customer-centric enterprises (Yrjölä, 2020). These organizations not only promptly respond to market shifts, but also align their strategic vision, operational methodologies, governance structures, and decision-making capabilities in line with the expectations of their stakeholders (Lyons et al., 2012b). This alignment empowers them to adapt to the changes in the business environment flawlessly. Such adaptability and value co-creation serves as both a protection against disruptions in established markets and a strategic differentiator (Lyons et al., 2012). By understanding and addressing the evolving needs of their clientele, these enterprises position themselves as pioneers, paving the way for sustained relevance and leadership in the marketplace.

Although there is emerging literature on the roles of stakeholders and how to involve them in value co-creation (López-Cabarcos et al., 2020; Pandey & Kumar, 2021; Tran & Vu, 2021; Yen et al., 2020; Tsai & Chih-Fang, 2023), the empirical evidence is still scant; especially in sustainable value co-creation in B2B business environments. Therefore, this paper aims to contribute to filling this gap by offering a case study from a B2B sustainable value co-creation environment in the machine manufacturing industry of food processing machines in The Netherlands. Our main research question is, “What actions do B2B customers expect for enhanced machinery sustainability?”. We address this question with an in-depth, single case study. Remainder of this paper is organized as follows: in the following section, we provide a literature review of co-creation of value in connection to sustainability and circularity. Afterwards, we introduce the case study with the research methodology and data collection. After analysing our case study using the boundary framework, we state the results and conclusions.

2 Literature Review

2.1 Co-Creation of Value

In this paper, we state customer centric vision, also can be referred to as the customer value co-creation, as the “collaborative generation of service value between customers and service companies aimed at delivering tailored customer service experiences” (Prahalad & Ramaswamy, 2004). Additionally, customer value co-creation behaviour also means the active participation of customers in the creation of value (Shamim et al., 2016). The per-

ception of value from the customer's standpoint balances perceived benefits against the sacrifices associated with a product or service offering (Prahalad & Ramaswamy, 2004). This interchange relies on multidimensional value attributes, including quality, customization levels, and pricing structures. In this regard, our study clarifies how the concept of value co-creation manifest within the B2B environment specifically in machine manufacturing industry. Examining how customer-centric visions and the principles of co-creation operate within B2B relationships, can inform us on the details and unique dynamics of value creation in this context.

There has been a continuing discourse on how users can participate in the co-creation process. Frow et al. (2015) systemized co-creation forms and identified twelve distinct categories. These categories include various dimensions of co-creation. Co-conception of ideas involves jointly developing projects and solutions, fostering collaborative ideation. Co-meaning creation revolves around the shared understanding and interpretation of concepts within user communities. Co-design engages customers in contributing their insights to product or service design. Co-consumption involves sharing consumption experiences among customers. Co-experience focuses on collective product or service experiences facilitated through social interactions. Moreover, specific co-creation forms relate explicitly to traditional marketing aspects. Co-production integrates customers into the production process and value proposition design. Co-promotion entails customers enthusiastically advocating for a brand through their channels. Co-pricing involves customers expressing their willingness to pay based on perceived product or service value. Co-distribution engages customers in various distribution activities. Co-maintenance generally pertains to customer involvement in refurbishment or recovery endeavours, while co-outsourcing implies integrating customer resources into the company's outsourcing processes. Co-disposal refers to post-consumption actions, including recycling products and materials. Despite these categorizations and increasing level of empirical contributions in to the field of value co-creation, current research also indicates that more research is needed on the topic of impact and benefits of value co creation on enterprises and customers (Fan & Luo, 2020). Therefore, in our study, we focus on the needs and expectations of the B2B customers of products towards a co-conception and co-design aspects and study how they can be reconciled by the producer. We implemented a generative approach to guide the customers into expressing their needs and expectations with interviews.

Although some authors include multiple stakeholders in value co-creation (Driessen & Hillebrand, 2013), the focus has been on the relationship between customer and the firm, where Vargo and Lusch (2016) state that “value is co-created by multiple actors, always including the beneficiary”. Within this model that emphasises the subjective perception of customer value, the Service-Dominant Logic (SDL) places emphasis on the relational dimension in value creation. This dimension includes the concept of value-in-use, explaining the value derived through a customer's direct engagement and consumption of a service (Vargo & Lusch, 2008) It requires a departure from

viewing value as a static attribute inherent in a product or service. Instead, it positions value as an outcome shaped by the interactions between the offering and the perceptions and experiences of the customer. This dynamic notion recognizes that value evolves across the customer journey, moulded by their distinct contexts, needs, and preferences. Key to the SDL is the emphasis on the relational dimension, highlighting the co-creative essence of value. It stresses that value determination extends beyond the mere features of a product or service, originating from the exchanges between customers and service providers. It steers businesses away from transactional orientations toward fostering long-lasting relationships and cultivating experiences that constantly enhance perceived value for customers. In other words, value co-creation is a process where, “the relationship between the provider and the customer is viewed as a longitudinal, dynamic, interactive set of experiences and activities performed by the provider and the customer.”(Payne et al., 2008). Therefore, in our study customer co-creation of value is studied not only from a single perspective, which is the contribution to sustainability, but also from the perspective of understanding the needs of the customer from the product whilst also retaining economic profitability.

2.2 Sustainable Value Co-Creation

The rising challenges at the systemic level, including sustainability concerns such as the climate change, resource utilization, and socioeconomic disparities, exert mounting pressure on enterprises. This requires a substantive re-evaluation and transformation of their daily operations and behavioural patterns to effectively engage with sustainability imperatives. On the other hand, this paradigm shift requires extensive collaboration across stakeholders within the industrial ecosystem. The attainment of a sustainable society is contingent upon a concerted effort towards common sustainable objectives (Bocken et al., 2015).

This transition emphasises the need for businesses to reconceptualise their roles within a broader societal context. In their role, businesses function as integral components of a larger fabric, coordinating efforts alongside diverse stakeholders. Businesses primarily focus their innovation activities on the enhancement of current technologies and production systems, primarily aiming to bolster energy and resource efficiency. Businesses driven by sustainability, perceive environmental and social challenges as prospects within the market landscape that warrant exploration (Berchicci, 2008). However, the attempts to tackle these prospects often overlook crucial elements essential to the realization of successful sustainable innovation; such as the integration of customer-centric advantages alongside technological efficacy in the creation and delivery of sustainable offerings (Keskin et al., 2013) and stimulating a more sustainable customer behaviour and interaction with the products (Daae et al., 2018). Moreover, the balance between sustainability objectives and profitability and economic efficiency remains a complex and intricate endeavour (Zahra et al., 2009). Businesses also face significant

challenges in translating their sustainability aspirations into customer-valued product attributes (York & Venkataraman, 2010). For example, sustainable machining is defined as “a cleaner, safer, and environmentally friendly method which can be used by reducing waste, reducing power consumption, and enhancing operational safety.”(Jayal et al., 2010). To achieve such objectives, collaborating with external stakeholders becomes imperative to acquire the essential resources and capabilities vital for innovation exploitation. The network of stakeholders of the businesses provide them with relevant market insights and guidance on effective market engagement strategies (Elfring & Hulsink, 2003). Therefore, to achieve a major transition towards sustainability, there needs to be a convergence of environmental and social imperatives within corporate operations and innovation practices (Boons & Lüdeke-Freund, 2013).

In this regard, sustainable business models (SBM) aim to strengthen corporate strategies of sustainable development by integrating sustainability objectives into their operational frameworks. This convergence aims to simultaneously drive profitability and foster a positive societal and environmental impact (Schaltegger et al., 2016; Stubbs & Cocklin, 2008; Tyl et al., 2015). Using the business model approach as a conduit for achieving sustainable development presents an opportunity for more comprehensive solutions involving multi-level stakeholders and bears implications for company's operations, processes, and resource allocation (Teece, 2010). Consequently, an SBM exceeds incremental advancements or enhancements in operational and technological efficiencies.

The main tenet of an SBM is the sustainable value proposition—a proposition that facilitates simultaneous value creation for a myriad of stakeholders, such as customers, shareholders, suppliers, partners, and notably, the broader environment and society (Bocken et al., 2015; Tyl et al., 2015). Such a holistic value proposition serves as a prerequisite in steering sustainable innovation beyond immediate profitability, prioritizing the shared value for all involved entities. In our study, by investigating the process of formulating a sustainable value proposition, we aim to clarify the challenges and strategies involved in aligning customer-centric advantages, sustainable behaviour stimulation, and collaborative efforts with external stakeholders to drive innovation and market engagement in line with sustainable objectives.

Involvement of multiple stakeholders in sustainable value co-creation may involve developing new competencies, adjusting positions in value chains, or even redefining organizational purposes by the company. As a result, existing organizational boundaries will shift and new ones will be formed to address environmental and societal challenges (Paulsen & Hernes, 2003; Velter et al., 2021). The existing value propositions, value creation, delivery, and value capture need to be realigned and redefined with the new boundaries. Recent research suggests that boundary work theory provides a valuable framework for dissecting boundary alignment processes in sustainable business models (Velter et al., 2020) which involves three phases: exploration, brokering, and implementation. Exploration defines problems and seeks solutions, aiming for systemic changes (Roome & Louche, 2016). Brokering

negotiates critical boundaries, adjusting innovation understandings, often with intermediary actors (Aspeteg & Bergek, 2020). Implementation formalizes agreements, experiments with changes like new purposes and partnerships (Baldassarre et al., 2020; Velter et al., 2020). In our study we utilized the exploration phase to provide an empirical case for initiating new organizational boundaries aligned with sustainability objectives.

2.3 Circular Economy and Value Co-Creation

Circular economy concept is particularly appropriate in analysing value co-creation. Transitioning from the conventional "linear" economic model to one founded on a circular economy necessitates the adoption of virtuous practices by not only businesses but also other pivotal stakeholders (Bocken et al., 2018). This shift implies that circular-oriented enterprises must collaborate with diverse actors, allocating specific roles and responsibilities, thereby fostering an environment conducive to circular practices (Parida et al., 2019). Previous literature on sustainable firms highlights role of networks and collaborations when introducing sustainable innovations (Rizzi et al., 2013). Circular business models involve a varied form of partnerships not only with suppliers but also for the customers. Therefore involving customers in the co-creation of sustainable or circular business models and innovations, remains significant. Effectively managing the product life cycle sustainably will yield a competitive advantage only when customers acknowledge and value the sustainable aspects, which would lead to a "sustainable superiority."

Zucchella (2019) define "born circular firms" as the firms which have been "set up from scratch following an idea to create both economic and social/environmental value, applying the principles and the business models of the circular economy" and "growing circular" firms which are more mature firms and which have been "founded years ago pioneering the idea to do business while doing good for the planet by closing the resources loops." Our study is about a growing circular firm in the machine manufacturing industry for food processing machines, interacting with their B2B customers. Such growing circular firms face a more complicated course, because they already have "an existing reality including organizational practices, human behaviours with resistance to change, given talents not easy to transfer, technological assets no more suitable, norms and rules becoming obsolete, or diverse institutional prescriptions not flexible minded." (Urban, 2019). Therefore, undertaking a challenge towards becoming circular will require a strong innovative drive, and the ability to see through new business opportunities aligned with sustainability objectives. Such a path is different for each organization. Our case study presents strategies of a growing circular firm and presents how it manages its transition challenges including value co-creation, and aims to contribute to the literature with its findings.

Although the literature has mostly studied customer co-creation in the end-customer context, B2B context also warrants attention. In B2B contexts,

the customers of the producer (also referred to as the B2B producer and B2B customers) are the sellers to the end-customers. Therefore, B2B customers possess knowledge on the needs and the expectations of the end customers from the product they use. Such needs and requirements entail sustainability related expectations from the product. Therefore, B2B producers can collect such expectations of the end users through B2B customers.

In our paper, we aim to highlight the role of customer co-creation in a B2B environment mainly focusing on the sub-topics of co-conception and co-design. For this research, we analysed a single case study with a company in the food processing industry in The Netherlands. In order to conduct this research, the following research question has been formulated: “What are the actions that B2B customers expect the B2B producer to take so that their machinery becomes more environmentally sustainable?”

3 Methodology

3.1 Research Design

We used a single case study methodology as done in previous studies (Edmondson & Mcmanus, 2007; Yin, 2013). This approach has been shown to facilitate a more detailed description of a phenomenon (Siggelkow, 2007) and a deeper exploration of the subject (Dyer & Wilkins, 1991), which are in line with the objectives of this study. We also used a collaborative research design, incorporating business perspectives while contributing to a theory (Freytag & Young, 2017) in a qualitative mixed-approach framework. The case study benefits from previous theoretical findings and aims to expand them with empirical findings from the business.

The company studied in our case study is referred to as the Eco Machine for reasons of anonymity. Eco Machine, located in The Netherlands, is active in the food-processing and handling industry with its food-processing machinery. The product portfolio of Eco Machine consists of single processing machines, and full processing product lines. The company sells these products in more than 110 countries with the Germany-Austria-Switzerland (DACH) region being the most profitable. Eco Machine’s customers are mostly farmers, food-processor companies and hospitality cooperations. This means that the company is active in the B2B market and is a small and medium sized company (SME). The company creates their products with their own production, research & development (R&D), engineering and 24/7 service and support. Currently some actions such as waste efficiency and the sales of refurbished machines are being considered. The company is eager to take further steps in making their company and machinery more environmentally sustainable. Eco Machine is active in the Food-Processing and Handling industry (which we will refer to as the “industry” hereafter).

The first step that has been taken to answer the research question, has been to identify the “as-is” situation of the actions that have already been

taken by Eco Machine and similar companies in the industry to become environmentally more sustainable.

In order to analyse the research question systematically we used the Sustainable Business Model Innovation (SBMI) model. This model promotes a business to cooperate with its external stakeholders to create a new positive impact and reduce the negative impact that they have on the environment (Velter et al., 2021). In order to achieve new value creation, delivery and capture, one has to go through multiple stages.

“Value Propositions”, “Value Creation & Delivery” and “Value Capture” in the model will be created after a successful boundary alignment between the four selected boundaries during the boundary work. The four boundaries are the boundary of identity, boundary of power, boundary of competence and boundary of efficiency. The boundary of identity is the statement of the company’s goal concerning environmental sustainability and how it wants to achieve this goal. The boundary of power is the focus to win over other businesses to participate in becoming more sustainable. The boundary of competence identifies the resources that have been used by the company, which will be optimized. The last boundary, the boundary of efficiency, shows the actions that must be taken to create, deliver and capture value. These boundaries are formed through three phases: exploration, brokering and implementation. The first phase, exploring, will show the first activities undertaken towards the event or problem. During the second phase, brokering, critical stakeholders are contacted to discuss boundaries to create, innovate or strengthen the values. In the last phase, implementing, these values are agreed on between the company and stakeholders and implemented in a new business model or strategy.

In our study, we focus on the first phase, which is the exploration phase. During the exploration phase, the research will indicate what actions at the company and in the industry already have been taken towards environmental sustainability. In other words, an “as-is” situation will be created. After this stage a “to-be” situation will be formulated. Both of these phases are done in the exploration phase. We will use only the exploration phase in our research because the aim of our research has been set on exploring client’s demands also called boundaries. During this phase of our research, we will first choose which stakeholders will be interviewed. During the interview, the steps that Eco Machine should take to make its machinery more environmentally sustainable will be discussed. The actions will be connected to the four boundaries.

Creswell & Plano Clark (2018) provides a foundation for understanding the appropriateness of interviews in exploring B2B views. The qualitative research design principles outlined by Creswell & Plano Clark (2018) emphasize the significance of gaining a deep understanding of participants' perspectives, making interviews a suitable choice for investigating complex phenomena such as B2B interactions. The open-ended nature of interviews aligns with Creswell's emphasis on flexibility and exploration in qualitative research, allowing for an in-depth exploration of the intricacies of B2B relationships. By following Creswell's guidance, we utilized a methodological

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approach that aligns with the principles of rigor and depth necessary for a comprehensive exploration of B2B views through interviews.

The next step has been to find the right B2B customers with an aim to research the customer's demands. We used the customer pyramid model to map and segment the customers of Eco Machine. The customer pyramid has multiple stages to segment the customers (Zeithaml et al., 2001). The segmentation is based on how profitable the customer is for the company. In the pyramid, there is a total of four tiers. The goal here identified by the company has been to align economic goals with goals of sustainability also known as competitive sustainability.

The tiers are described from bottom to top. The first level is lead. In this tier, the customers with the least amount of revenue are selected. These customers are mainly the small players. The next tier is iron, where the customers are medium-sized customers. The gold tier is the selection of big players, meaning that these customers already have a high amount of purchase value. At the top, there is the platinum tier; it is the segment of the biggest customers, where a small number of customers make up for a big amount of the profitability (Zeithaml et al., 2001). The profitability level per tier differs per company.

Selecting the sample size involves a delicate balance between ensuring adequate representation and managing practical constraints. In the context of B2B interviews, the sample size is determined by reaching a point of saturation, where new information or perspectives cease to emerge, indicating that the sample is sufficiently representative. This aligns with qualitative research principles, as discussed by (Creswell & Plano Clark, 2018; Saunders et al., 2015), emphasizing depth over breadth in data collection. Additionally, practical considerations such as time, resources, and access to participants play a role in determining a feasible sample size that maintains the quality and relevance of the study. The aim is to achieve a balance that allows for a thorough exploration of B2B views while being mindful of logistical constraints.

Finally, after identifying the main actions that the customers want Eco Machine to take for environmental sustainability, a multi-criteria decision matrix has been used to prioritize the actions. Each action has been graded on the criteria. The criteria are desirability, feasibility and sustainability. Desirability shows the customer's interest and wants in the action. Feasibility indicates whether the organization, Eco Machinery, has the right resources in order to take action. Sustainability is the estimated amount of improving the environmental sustainability with the chosen action. After the overall score has been calculated, the actions have been ranked from highest to lowest score.

3.2 Data Collection

We collected secondary and primary data to answer the research question. Initially, a secondary data collection has been carried out build a foundation for the as-is situation on the topic of environmental sustainability at

Eco Machine and in the food-processing industry. Secondary data is collected also to build a foundation for the clustering of the Eco Machine's customers. The secondary data is utilized for the exploration phase of the SBMI model. Data is collected from the company internal database and external databases such as Next Dossier and Business Source Collect. The customers that are analyzed are selected from those customers who buy the "food processors" and who are under the "farmers" category,- since these two groups constitute the largest group of customers for Eco Machine.

For each stage of the analysis, we also collected primary data. Initially we conducted semi-structured interviews with companies in the food-processing industry and a semi-structured interview with Eco Machine's Chief Technology Officer (CTO). The interviews were guided by the secondary data collected in the prior phase. These interviews served to create an overview of the current actions taken towards environmental sustainability and analyzing the exploration phase of the SBMI model. Afterwards, the identified B2B customers of Eco Machine are also interviewed to collect their needs and expectations regarding environmental sustainability from Eco Machine.

Content analysis method (Saunders et al., 2015) is used to find the correlation between the companies in the food-processing industry and the topic of environmental sustainability, as well as the correlation between the customers and when deciding which B2B customers will be invited to participate in the interviews. For data analysis of the interviews, the software Atlas.Ti is used. The different actions and expectations from the customer' interviews are listed and put into the broad themes. For example, two different actions with the same outcome (e.g. reduction of waste) are linked with each other using the thematic analysis. In our research, the data will be the different actions and the broad themes will be the different parts of the process where the most value destruction takes place. The themes are mainly the boundaries of the SBMI model.

4 Analysis

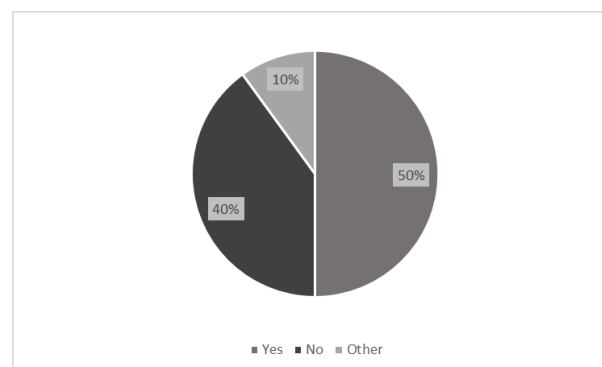
4.1 Exploring environmental sustainability in the food-processing industry

The creation of an as-is situation of environmental sustainability in industry and in Eco Machine has been the first step in the exploration phase of the SBMI model. This has been done to get an overview of what already has been done and what boundaries already have taken place as well as which boundaries are missing, and which boundaries can be improved. The boundaries are the four boundaries, boundary of identity, boundary of power, boundary of competence and boundary of efficiency from the SBMI model. These boundaries have been assessed for the other companies in the food processing industry as well. These companies have been selected together with Eco Machine from their competitive environment.

4.2 Boundaries taken in the food-processing industry

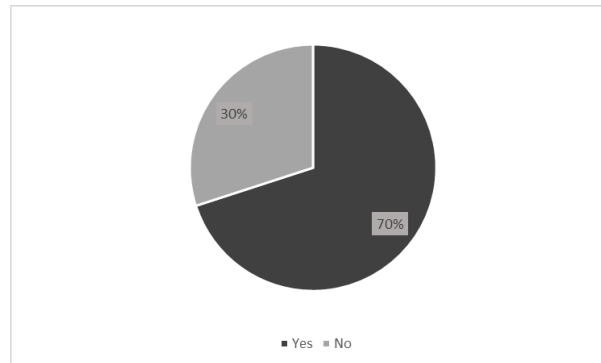
To see the steps that the companies have taken towards environmental sustainability, the websites of these companies have been analysed. 70% percent of these companies do not state anything about environmental sustainability, while 30% percent do. Out of the 30%, twenty of them have been selected for an interview. In line with the findings of the secondary research and interviews with the CTO of Eco Machine, the companies have been asked to comment on the following topics: whether they sell refurbished machines, try to improve their machinery on waste-, energy-, and/or water-reduction, make use of recyclable materials, and whether the company and their customers are aware of the sustainability topic and are willing to change to become more environmentally sustainable. After the data has been gathered, the answers have been quantified in order to create the as-is situation of the boundaries taken in the food-processing machinery industry.

Figure 1: Refurbished Machines



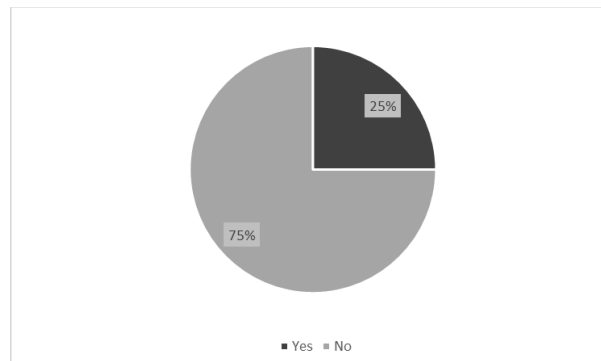
In the interview, the companies have been asked what they do on the topic of environmental sustainability. At first, the boundary of efficiency has been discussed, with the creation of new value with the refurbished machines. 50% of the companies have stated that they are selling refurbished machines. 10% state that they do not sell refurbished machines now but believe that it will become important in the future. The rest of the companies expressed that they do not sell any refurbished machines (Figure 1).

Figure 2: Energy / Waste Reduction



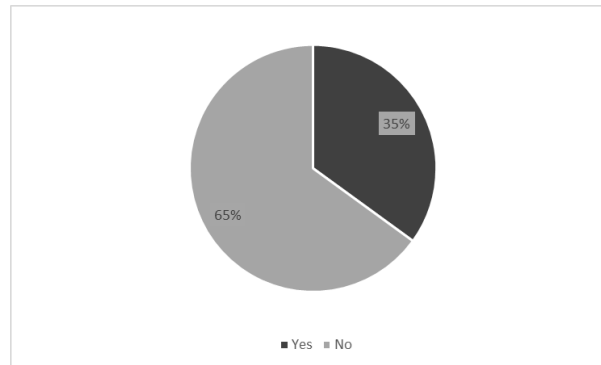
The second boundary that has been discussed is the boundary of competence, where new machines have been optimized with energy-, waste-, and water- reduction. 70% of the companies expressed that they have adapted their new machinery to less usage of water or energy or production of waste (Figure 2). This has also been done to prevent that the customers have higher costs. Regarding recyclable materials, only a quarter of the companies make use of materials that can be recycled (Figure 3).

Figure 3: Recyclable Materials



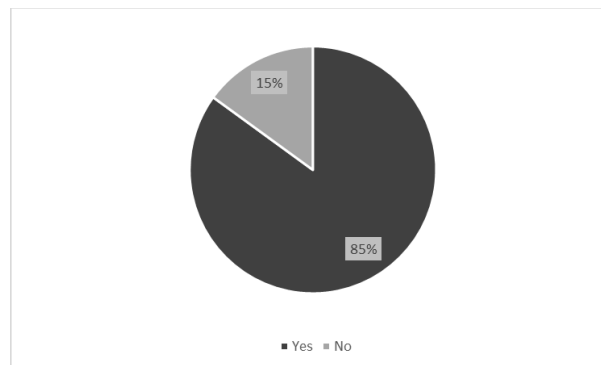
The next boundary that has been discussed was the boundary of identity and is the analysis of the willingness of the companies and their customers to become environmentally more sustainable. On both occasions the answer was very clear, 65% of the companies do not see sustainability as an important factor in their processes and are only willing to adapt their processes due requests from their customers (Figure 4). On the contrary, customers are willing to become environmentally more sustainable. This is shown with a response of 85% percent (Figure 5).

Figure 4: Company Willingness



The willingness of the customers can relate to the last boundary, boundary of power. The willingness shows that not the companies, but their clients are the driver behind becoming environmentally more sustainable. Overall, we can conclude that companies are adapting their processes and machinery to environmental sustainability by mainly reducing the energy, water and waste of the machinery and selling refurbished machines. This decision is only driven by the fact that their customers asked the companies to adapt their machinery.

Figure 5: Customer Willingness



4.3 Boundaries taken at Eco Machine

In order to create an overview of actions taken towards becoming environmentally sustainable at Eco Machine, a semi-structured interview has been conducted with the CTO of the company. Questions have been asked regarding this topic, in addition to questions about improvements of the machines that have been made in the recent years.

Eco Machine has taken multiple steps in order to become environmentally more sustainable. Regarding the boundary of competence and the reduction of energy, water usage and waste, energy consumption of the machinery has been reduced by using different oils in the motors. Additionally, waste has been reduced by making the waste sorting of the machines more efficient. The water usage has been minimized by reusing the water in some of the processes. An example is the scrapping process, at the beginning the water is being filtered and reused. This leads to less water usage. Another action is taken in the boundary of efficiency with the usage of stainless steel as their main material since, stainless steel has a longer life span. This makes it possible to refurbish their machinery and resell them. The last action, also part of the boundary of efficiency, is the offering of service for preventive maintenance. Preventive maintenance ensures that the life span of the machine increases.

Thus, we can say that Eco Machine already has taken five actions towards their machines becoming more environmentally sustainable. These actions have been taken after communicating with their B2B customers. The customers communicated with the company that they would like to have machines that use less water and energy. The CTO also stated that clients are willing to become more environmentally friendly, but that some clients are not considering it sufficiently. He believes that the company should discover together with its customers what actions could be taken next and what actions are useful. This shows that the boundary of power is in control of the customers and not at Eco Machine.

The interviewee proposed other actions that are considered and might be taken in the future to improve the machines. These would be their boundaries of identity. He sees the overall goal for the future to make the machines as efficient as possible. This way the machines and the customers are becoming more and more environmentally sustainable. Monitoring is one example to achieve this. Interviewee is convinced that with the monitoring of the machines, it can be better identified at what point electrical parts need to be replaced. Thereby, these parts can be used until the maximum lifespan. Next to this, there are still multiple options to make the machines more water, energy or waste efficient.

4.4 Identification of B2B customers

Eco Machine has a Customer Relationship Management (CRM) tool. In total 3584 client accounts have been registered in the CRM. We narrowed down the customers by using criteria decided together with the company. These criteria are the B2B customer must have made an order since the start of 2020 (to make sure the customer is using one of the recent and up-to-date machines), focus is on clients from the DACH region, The Netherlands and Eastern Europe regions (these regions are the most profitable regions for Eco Machine), and that the focus is on farmers/food processor

customer group (who represent the majority of B2B customers). These criteria has resulted in 49 B2B customers.

After the list has been created of all the clients that fulfilled the criteria stated, we created the customer pyramid to segment the customers based on the purchase value since the start of 2020. For the customer pyramid, it has been decided to create three different pyramids for the three selected regions. The regions are, The Netherlands, Germany & Eastern Europe. This has been done since the vision on sustainability is different in each region. To analyze this better, it has been chosen to perform the customer pyramid for the three regions. Next to that, it was also crucial to allocate what the value of each segment is. After the purchase value since 2020 was known from each customer, these values have been formed. The tiers were valued in the following:

1. Platinum Tier: € 100.000 +
2. Gold Tier: € 50.000 - € 99.999
3. Iron Tier: € 20.000 - € 49.999
4. Lead Tier: € 0 - € 19.999

After the tiers have been valued and formed, we segmented each customer in the tiers for the right customer pyramid of the specific region. To put it into perspective, the Dutch region consists of twenty-six customers, the German region of seventeen and the eastern European region of only six. Looking at the segmentation of the tiers, one has a totally different view. After the selection, the Dutch region consist only of one big customer. The Dutch clients mainly have a size of an iron or lead tier company because, in the Dutch customer pyramid, the iron tier consists of seven customers and the lead tier has the vast majority with eighteen clients. The German region looks a bit different. Except for the iron tier, the segmentation is relatively balanced. The biggest tier is the platinum tier consisting of eight clients. After this, there is the gold tier with five customers. Followed by the lead tier of four companies and iron tier only having one company. After applying the criteria, the eastern European region had six companies left. The majority of four is in the platinum tier while gold and iron both consists of one client.

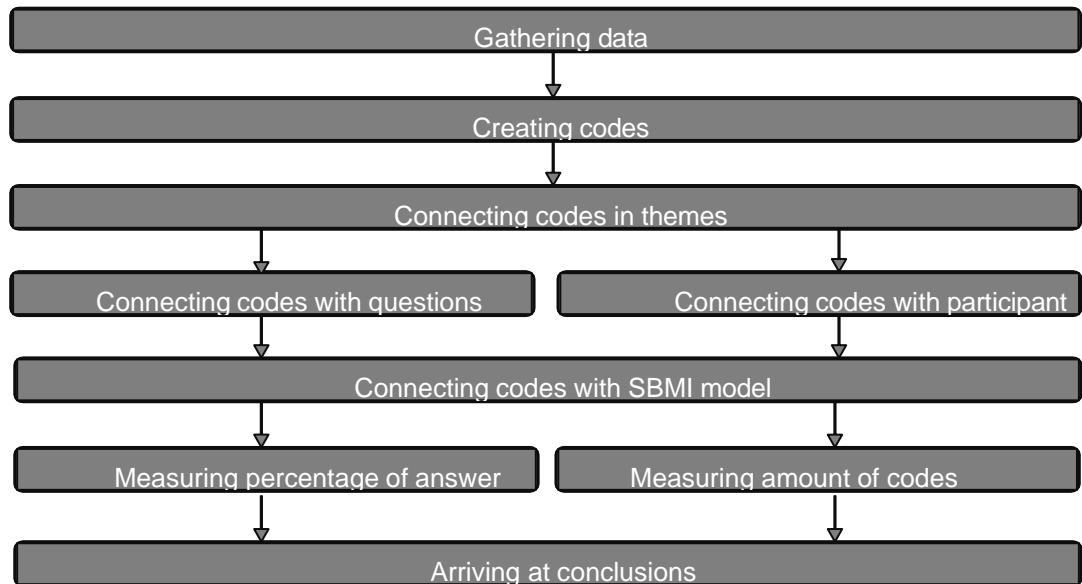
After finalizing the customer pyramids for the chosen regions, we chose the clients to invite for the interviews out of these pyramids. We decided to choose one B2B customer from every tier. Next to that, it was decided that most of the interviews will be held with companies from the DACH (Germany) region, since this region is the most profitable and thus most interesting to research on the customer's demands on environmental sustainability. After that, customers from the Dutch region are the second most important, since this is the second biggest region and the nearest region. Thus, it will be easier to implement the environmental sustainability chances in this market. The last region, eastern European, it has been chosen to keep a balance between each tier. If the tier did not consist of enough customers to keep a balance, the maximum of customers in that segment will be invited

for an interview. In total 24 B2B companies have been identified for an interview, 16 of them agreed to an interview.

The first part of the interview was the identification of the optimization of the usage of energy, water and waste in the process. This could be for example the reduction of these resources, next to reuse. For example, it can be using the waste for other acts such as animal feed, but also for processing it into different product, or purification of the water and reusing it again in the process. The second identification is the optimization of the machinery. This would mean to optimize the process and to decrease the defects and prevent maintenance. The last identification would be the use of the machinery in the final phase. Improvements in this topic could be refurbishment or recycling of parts of the machine. With these options the life span of parts or the whole machine can be increased. All identifications have also been identified in the as-is situation in the food-processing industry and at Eco Machine. After these identifications have been discussed, the interview continued with asking if the interviewee is familiar with the impact that environmental sustainability has on their processes and if the interviewee is open to change their process to become more environmentally sustainable. This was followed by discussing if and what actions the interviewee already has taken to become more environmentally friendly. Next topic was the interviewee's goals and demands for the future on the topic. When these have been stated, it was discussed how Eco Machine could be able to help them achieve these goals and demands.

During the interviews, similar answers have been identified leading to the same code. These codes are put into broader themes to connect the codes. After each interview is coded, the codes relate to each other in a broad theme. Next step was to connect the codes with the question and participant. Afterwards, the codes have been connected to the SBMI model, to create a connection between the interview and the exploring of the boundaries. After the connections have been made, we measured the codes and answers. Percentages are calculated to see how many participants had the same answer and to calculate the weight of the answer. Next to that, the codes have been counted to see how often the codes have been used to verify the outcome of the percentages. The analysis is performed with Atlas.Ti, a software to analyze qualitative data. The whole process of the analysis can be seen in Figure 3.

Figure 6: Description of the analysis of the interview (Own illustration)



5 Results

Each answer from the interviews are connected to the four boundaries from the SBMI model.

5.1 Boundary of identity

The first boundary is the boundary of identity. This is the company's motivation and aim on the topic of environmental sustainability. Interview results indicate that companies understood the impact of environmental sustainability. 88% of the participants agreed on this where 12% indicated they did not understand the impact of sustainability. Next to that, it has been asked if the participant is open to change their processes to become more environmentally sustainable. This also has been answered positively by 94%, although 31% would only be willing if the change would reduce their costs. This was also visible with the coding, where out of the 16 quotations, 8 were stating that they would be open to change, while 5 others would do it only if it reduces costs and one said they would agree if the change makes sense to him. The other 6% were not open since their output is too low to consider any change, this was also stated with two quotations of the code 'output too low'. The motivation of becoming more environmentally sustainable has been stated by the participants. 31% stated that as an organization they

want to become more environmentally sustainable to help the planet. The next two answers with 25% were that the participants' clients asked for sustainability standards, the other answer was that with improving its environmental sustainability the participant was able to reduce costs. For those this was their main reason. One other participant just liked to have such an improvement for himself.

Table 1: Percentage and Quotations of Boundary of Identity I

	Percentage	Quotations
Impact is known	88%	13
Impact is not known	12%	2
Open to change process	63%	9
Open to change process if it reduces costs	31%	5
Environmental awareness	31%	10
Client asks for sustainability	25%	4
Costs reducing	25%	7
For himself	6%	1

Boundaries of identity from Eco Machine's clients are for a big part the own motivation to make the planet a better planet and improve its environmental sustainability. But the question remains where in their process do they believe it is most crucial to become more environmentally sustainable? This was also clearly stated by the participants with 63%, that the usage of water is most crucial to be solved first to become more environmentally friendly. To continue, 13% want to see a combination of improving the usage of water & energy in their process. The remaining 25% have the opinion that usage of waste should be improved first.

Table 2: Percentage and Quotations of Boundary of Identity II

	Percentage	Quotations
Usage of water	63%	17
Usage of water & energy	13%	3
Usage of waste	25%	4

5.2 Boundary of power

The second boundary is the boundary of power and discusses if the clients are persuading their stakeholders to become more environmentally sustainable. This can be connected with the previous boundary, the boundary of identity. Here again the reason for becoming more environmentally sustainable is discussed. As mentioned, one third is making the change since they want to help the planet. Thus, they are also persuading their stakeholders to become more environmentally sustainable. An example of this could be that a participant got in contact with Eco Machine to improve the process in order to reduce the usage of water to become more environmentally friendly. For 25% of the participants, it is the other way around. For them, their stakeholders, the clients, want them to change and to become more environmentally friendly. The rest of the participants did not mention that they are persuading their stakeholders to become more environmentally sustainable. Mainly they look first in their own process to improve, for example to reduce costs.

Table 3: Percentage and Quotations of Boundary of Power I

	Percentage	Quotations
Environmental awareness	31%	10
Client asks for sustainability	25%	4
Costs reducing	25%	7
For himself	6%	1

From Eco Machine, it was also requested to investigate the power of its competitors. In other words, if customers notice environmental sustainability enhancements on the machinery, they come from Eco Machine's competitors. 87% of the interviewees did not identify an improvement or was not able to answer the question. Two clients, 13%, stated that they identified improvements in the energy and water usage.

Table 4: Percentage and Quotations of Boundary of Power II

	Percentage	Quotations
No improvements identified	83%	8
Reduction of energy & water	13%	2

5.3 Boundary of competence

Boundary of competence is the next boundary of the SBMI model and implies the optimization of the resources that the clients already have to become more environmentally friendly. Here we see what actions they already have taken and what actions they want to take in the future on optimization to meet their demands. To create a connection with Eco Machine, optimizations of the machinery in the process has been discussed. The participants mentioned the actions that they have already taken and those that they want to take in order to improve their environmental sustainability. First, the optimizations that have already taken place are introduced. The focus of the optimizations that have already taken place are on the reduction of resources needed. The main reduction has taken place on reducing the waste. 6 out of the 16 participants mentioned that they already optimized their machinery which led to the fact that the participant had less waste. After this, the biggest optimization has taken place at both the usage of energy and usage of water. Here 5 out of the 16 have been stating that they are reducing its energy and/or water with machine optimization. Next to that 4 participants have stated that they have optimized their machinery and process in total to be more environmentally friendly.

Table 5: Percentage and Quotations of Boundary of Competence I

	Percentage	Quotations
Reduction of energy	31%	11
Reduction of water	25%	4
Reduction of waste	31%	10
Process / machinery optimization	25%	14

Next, the optimization actions that the participants want to take in the future are mentioned. For most participants the focus will be to continue and optimize its process and machinery to reduce the usage of water, energy and waste. For the usage of energy and water, 5 participants stated that they would optimize their process to reduce their consumption. While for waste, 4 participants stated this. Waste improvement is focused on reducing the waste in the peeling process and improving the weighing process. But the focus of these three components goes to the reduction of water, what has been mentioned in the description of the first boundary.

The majority of the interviewees stated that the biggest and the most focus for the boundary of competence is the boundary of reducing the usage of water. Next to that they mentioned that is important to reduce waste with the optimization of the peeler and the optimization of the weighing process.

Table 6: Percentage and Quotations of Boundary of Competence II

	Percentage	Quotations
Reduction of energy	37%	25
Reduction of water	50%	44
Reduction of waste	32%	37
Process / machinery optimization	32%	7

5.4 Boundary of efficiency

The last boundary, boundary of efficiency, discusses the actions that have already been taken or want to be taken to create, deliver and capture new value for the company's environmental sustainability. The difference with the boundary of competence would be that for the boundary of efficiency the focus goes into creating, delivering and capturing value with a creation of a whole new machine instead of optimizing an existing machine. Again, initially the boundaries that already have been taken are introduced starting with the value creation for the usage of energy. Most participants have taken the same steps, which is the usage of renewable energy with solar panels. 6 out of the 16 participants have stated that they use solar panels. This was the main action that has already been taken. One participant stood out, saying the company's process is CO₂ neutral since they are using their CO₂ output for their greenhouses. This makes 7 out of the 16 participants have taken actions to create new value with the usage of its energy. Considering the usage of water, the main response was that 4 participants have an installation to collect the water from the machine and reuse it again in their process:

for example to water the fields and sometimes with the combination of purifying the water. In the end, 6 participants stated that they create new value with its usage of water. Value creation in the usage of waste has been identified in two cases. The first case is the usage of waste for biogas. 4 participants stated doing this. Next to that, it is the usage of waste for animal feed. Here 8 participants mentioned this. A notable mention by one participant is that, they process their waste into a new product to create new value. These are the main value creations that have already taken place.

Table 7: Percentage and Quotations of Boundary of Efficiency I

	Percentage	Quotations
Solar panels	38%	12
CO ₂ neutral	6%	3
Reuse of water	25%	8
Biogas	25%	5
Waste used for animal feed	50%	10
Processing of waste	6%	2

Next, the focus was on the creation of value that want to be taken in the future. Starting again with the usage of energy. For this component, the participants did not see any improvements. The only actions that were proposed to create, deliver and capture value was to install more solar panels and to become CO₂ neutral. In total, 3 participants stated actions to create value out of the usage of energy. With the usage of water, the opposite happened. More participants were open to share actions that they want to create in the upcoming years. The focus of these actions was to create an installation to capture used water, purify the used water and reuse it in the process. In total 6 participants stated that they would like to have this improved to their machinery. For the waste usage, the participants did not see any improvements again. The only improvement to create new value was the processing the waste for a new business. Eco Machine's machinery could help achieving that.

Table 8: Percentage and Quotations of Boundary of Efficiency II

	Percentage	Quotations
Solar panels	13%	3
CO ₂ neutral	6%	1
Reuse of water	31%	24
Purification of water	31%	14
New business for waste	13%	4

The last value creation action that is discussed is the use of refurbished machines. 7 companies stated that they have refurbished machines in their process. The reason of the decision to do this was because the machine had less costs. Additionally, 2 companies stated that the decision has been made because the machine had a function that was desirable within the process. 2 companies also mentioned that they do not sell or refurbish their old machinery, but keep them as a backup in case a machine has a malfunction to continue the process.

Table 9: Percentage and Quotations of Boundary of Efficiency III

	Percentage	Quotations
Refurbished machines	44%	15
Less costs	13%	2
Old ones used for backup	13%	2

5.5 Prioritization of Actions

The culmination of this research presents crucial insights into the desires and demands of Eco Machine’s customers within the food-processing industry regarding environmentally sustainable machinery. By synthesizing the findings from interviews conducted with customers and key personnel from Eco Machine, a definitive set of actions has emerged.

The initial phase of the analysis illuminated the contrasting stances between the food-processing industry's reluctance and its customers' willingness to embrace environmental sustainability. Notably, three primary actions were already in place: enhancing water, waste, and energy efficiency; offer-

ing refurbished machines; and providing preventive maintenance for machinery efficiency and longevity.

The meticulous customer selection process ensured a balanced representation across regions (Germany, the Netherlands, Eastern Europe) and customer tiers (platinum, gold, iron, lead). This comprehensive approach resulted in sixteen conducted interviews, revealing six core actions desired by Eco Machine’s customers.

Table 10: Feasibility score conclusion

	Boundary of Identity	Boundary of Power	Boundary of Competence	Boundary of Efficiency	Average
Action a	4	3	2	5	3,5
Action b	5	3	2	5	3,75
Action c	5	3	2	5	3,75
Action d	1	2	2	3	2
Action e	5	5	5	5	5
Action f	5	3	4	5	4,25

To distill these actions into a top five ranking, a multi-criteria decision-making framework is employed, including desirability, feasibility, and sustainability. The complexity of this decision-making process involved grading each criterion on a scale and seeking expert insights. The score of the criteria desirability has been based on the answers from the interview. For the criteria feasibility, Eco Machine’s different executives have been asked to rank each action. Then, each criterion is scored per action. The last and sixth action has not been included in the ranking, since the average score was too low to compare it with the remaining actions.

Table 11: Overall score conclusion

	Desirability	Feasibility	Sustainability	Average
Action a	3	3,5	4	3,5
Action b	3	3,75	5	3,9
Action c	5	3,75	4	4,25
Action d	1	2	2	1,67
Action e	2	5	3	3,33
Action f	1	4,25	4	3,08

Ultimately, the top five actions identified are as follows:

1. Minimization of water usage in the process
2. Re-usage of used water in the process
3. Purification of the used water
4. Peeler which peels less waste
5. Machines that offer processing of waste

These actions have been meticulously ranked based on their alignment with customer desires, feasibility within Eco Machine's resources, and their potential to enhance environmental sustainability. The exclusion of the sixth action from the ranking was due to its significantly lower average score compared to the others.

6 Discussion

The findings of this study resonate significantly with the literature on co-creation of value, sustainable value co-creation, and the circular economy. The literature extensively discusses the multidimensional nature of value co-creation, emphasizing customer-centric perspectives (Prahalad & Ramaswamy, 2004; Shamim et al., 2016). Specifically, it explores co-conception and co-design, aligning with this study's focus on understanding B2B customer expectations regarding environmental sustainability in product offerings.

Our analysis emphasizes the interconnectedness between the B2B producer and B2B customers in shaping sustainable value propositions. The study aligns with the Service-Dominant Logic (SDL), acknowledging that value creation is a dynamic, relational process influenced by customer interactions (Vargo & Lusch, 2008). It also emphasizes the longitudinal, interactive nature of customer-provider relationships, aligning with the investigation's approach to comprehend sustainability expectations while ensuring economic viability.

Furthermore, our research identifies the alignment between sustainability objectives and profitability as a complex endeavour, echoing concerns from prior literature (Zahra et al., 2009). The study reveals that while participants expressed motivation for sustainability, cost reduction remains a significant consideration, in line with the challenges of balancing sustainability and economic efficiency.

The discussion on SBMs reinforces the notion that sustainable value propositions are essential for driving innovation while simultaneously addressing environmental and societal concerns (Bocken et al., 2015; Tyl et al., 2015). Our study's focus on exploring needs and expectations for environmental sustainability within the B2B context complements this discourse, placing emphasis on the challenges and strategies involved in aligning customer-centric advantages with sustainable objectives.

Moreover, our study intersects with the concept of boundary work theory, particularly in the phases of exploration, brokering, and implementation (Roome & Louche, 2016; Velter et al., 2020). The empirical exploration phase of the study corresponds to initiating new organizational boundaries aligned with sustainability objectives, as suggested by the literature.

The literature emphasizes the significance of engaging multiple stakeholders in sustainable value co-creation, aligning with our study's acknowledgment of the role of B2B customers in understanding end-user expectations related to sustainability (Vargo & Lusch, 2016). It emphasizes the importance of collaboration and resource integration from diverse stakeholders in driving sustainable innovation, aligning with this study's exploration of stakeholder expectations and needs.

Lastly, the discussion on circular economy principles resonates with our study's focus on a growing circular firm, recognizing the challenges in transitioning toward circularity within an existing organizational framework (Urban, 2019). Our study provides insights into the strategies employed by a growing circular firm in the food processing industry, aligning with the literature's call for innovative approaches aligned with sustainability objectives.

Our research conclusions also offer several practical implications for practitioners, particularly those operating in B2B contexts within industries focused on sustainability and circular economy principles:

- 1. Emphasis on Co-Creation of Value:** Engage in customer-centric, collaborative innovation by co-designing and co-developing products with B2B customers, focusing on integrating sustainability and economic objectives from the outset. This strategy not only strengthens relationships but also aligns product development with customer expectations and environmental sustainability goals, resulting in marketable and environmentally responsible products.
- 2. Sustainable Value Propositions:** Recognize the necessity of embedding sustainability into the core business strategy and encouraging long-term relationships with B2B customers. By developing value propositions that are both economically viable and environmentally sustainable, businesses can align profitability with sustainability goals, while longitudinal engagement helps in adapting to evolving sustainability expectations and economic considerations, highlighting the dynamic and relational nature of value creation.
- 3. Balancing Sustainability and Profitability:** Address the importance of achieving cost-efficiency alongside sustainability by innovating processes and product designs to reduce costs and enhance sustainability, through measures such as material efficiency, energy-saving techniques, or waste reduction. Simultaneously, it is crucial to clearly communicate the dual economic and environmental value of these sustainable products to B2B customers, emphasizing long-term cost savings, efficiency improve-

ments, and regulatory compliance to justify any premium pricing for these sustainable solutions.

4. **Stakeholder Engagement in Sustainable Innovation:** Engage and integrate diverse stakeholders, including suppliers, customers, and end-users, in the innovation process to ensure a comprehensive understanding of needs and expectations, leveraging their resources, capabilities, and knowledge. This collaborative approach not only drives sustainable innovation that benefits all parties but also leads to more effective solutions for complex sustainability challenges.
5. **Transitioning to Circularity:** For firms, particularly in sectors such as food processing, adopting circular economy principles necessitates innovative approaches that re-create product lifecycles, resource use, and waste management through strategies such as product-as-a-service models, recycling, and remanufacturing. This transition requires organizational adaptation, including the adoption of new business models, alterations in supply chain practices, and investments in technologies that facilitate circular processes, emphasizing the integral role of organizational change in embracing circular economy principles fully.

7 Authors

Devrim Eskiyeerli, PhD is an Associate Professor at the Fontys Venlo University of Applied Sciences, Research Group Business Innovation. Her work experience and research interests include international competitiveness, business model innovation, digital transformation, circular economy and clustering.

Gunnar Schmid has been working in the sales and quality management functions of industrial companies for 5 years. He has graduated from the Fontys Venlo University of Applied Sciences, Department of International Business. His research focuses on sustainability and circular economy.

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