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Applying the Circular Economy to a Business Model: An Illustrative Case Study of a Pioneering Energy Company

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Abstract: While the circular economy (CE) has awakened discussion in business model literature, understanding of the Circular Business Model (CBM) and value-creation opportunities in practice have been limited. This study focuses on one sustainable business model archetype: creating value from waste. It supports sustainable development by material circulation. We aim to provide an answer to the question of how a company converts its resources and capabilities into economic value by creating value from waste. This single case study in the Finnish energy sector focuses on a pioneering company applying CBM. The analysis more specifically illustrates the nine main elements of a business model: customer value proposition, segments, customer relationships, channels, key resources, key activities, partners, costs and revenues. Furthermore, we illustrate the internal and external adoption factors required to transform a Business Model Canvas (BMC) to a CBM framework.

Keywords: circular economy; sustainability; business model; business model canvas; innovation; case study; business opportunity; value creation

1 Introduction

Global megatrends are changing the way we think about our societies, environments, economies, resources and work. Globalisation, population growth, urbanisation, digitalisation, robotisation and customer behaviour all lead and contribute to the global transition to CE (Bocken et al., 2014; Ellen MacArthur Foundation, 2013; Lewandowski, 2016). CE is a new economic model that aims to reduce and eventually close the resource loop, enabling resources to be used as many times as possible and allowing sustainable and carbon-free economies to thrive globally (Ellen MacArthur Foundation, 2013; European Commission, 2016). CE offers value-creation opportunities for businesses, though the logic demands innovative CBMs (Boons et al., 2013).

Previous research on business models expressed the need for new business models within the CE context, yet the topic remains understudied, and real-life cases have not been extensively addressed (Antikainen and Valkokari, 2016). There is also a need for practical examples of how businesses can adopt CBMs to increase sustainability (Bocken, Rana and Short, 2015). This is because the CBMs are different from the traditional linear economic model (Bocken et al., 2016; Boons et al., 2013; Murray, Skene and Haynes, 2017).

In this paper, we are interested in how our case company does business according to one specific CE business archetype, namely creating value from waste. We aim to provide an answer to the question of how a company converts its resources and capabilities into economic value by creating value from waste. This is what the business model articulates. Thus, to answer the question we analyse each CBM component in the case company creating value from waste. Additionally, we analyse the role of both internal and external adaptation factors in implementing a CBM, as these two additional components are needed in the business model framework (Osterwalder and Pigneur, 2010) to develop a CBM framework (Lewandowski, 2016).

The single case study in this paper focuses on a company in the Finnish energy sector. The pioneering case company was chosen because of its business focus towards CE. In addition, it has invested on new technology to improve its capabilities and competitiveness in the market. Furthermore, the case company is illustrative in the sense that it shows CBM in actual business.

For each building block of the business model canvas, we summarised the corresponding strategies and activities related to CE business. This study contributes to the previous business model and CE research by showing that the CBM can be service-based and the development and implementation phases require an organisational culture change and investments in personnel education and commitment. The external political, economic, sociocultural and technological factors have all made an impact on applying the process. Moreover, the CBM is inherently built on cooperation and connectivity among different actors in the value and supply chain. There is a strong emphasis on the systematic nature of circular models, which is reflected, for example, in the company's offering of partnerships to its customers so that they are integrated into their entire value chain.

This paper is structured as follows. First, the next section outlines the theoretical framework of the study, where we elaborate on the business model and more precisely on CBMs. Second, the qualitative research approach, empirical data collection and analysis are presented. The next section describes the case and provides the analysis. Finally, the paper concludes with a discussion, conclusions and managerial implications.

2 Theoretical Framework

Bocken et al. (2014) developed the sustainable business model archetypes, which include maximising material and energy efficiency, creating value from waste, introducing renewable and natural processes (technological), delivering functionality rather than ownership,

adopting a stewardship role, encouraging sufficiency (social), repurposing the business for society/the environment, and developing scale-up solutions (organisational). In the present study, we focus on one type of CBM – creating value from waste – which consists of eliminating different kinds of waste “by turning waste streams into the useful and valuable input to other product and making better use of under-utilized capacity” [Bocken et al., (2014), pp.49]. This innovation is hereafter referred to as CBM. Innovation in this study is considered to be something new to the case firm, and a business model refers here to the activities of a company, how these activities are resourced, how they create value, and how returns are to be realised (Teece, 2010).

2.1 Analysing the circular business model

Not many studies on CBM frameworks seem to be available. Two approaches have been typical. First, a BMC has been used and product-service system elements have been analysed according to it (Barquet et al., 2013). A second option has been to incorporate business systems thinking in the BMC (Bocken et al., 2014). In this study, the BMC (Osterwalder and Pigneur, 2010) was chosen as the primary tool for analysing the CBM. This choice was made because it is practical and widely recognised. The BMC consists of nine components, which are customer segments, value proposition, channels, customer relationships, key resources, key activities, key partners, cost structure and revenue streams. The review conducted by Lewandowski (2016), however, revealed that two additional components are needed in the business model framework to develop a CBM framework. These are the take-back system, including take-back management, customer relations and channels, and adaptation factors, including organisational capabilities and PEST factors, i.e. political, economic, social and technological factors. Thus, these components are also considered in this study.

2.2 Key components of a circular business model

The key component in a CBM is the value proposition. The value proposition component consists of the circular product, virtual service, the product-service system (PSS), and incentives for customers in the take-back system (Lewandowski, 2016). The circular value proposition can be a product, a service related to a product, or a service (De Jong et al., 2015). Circular products typically have special features related to CE. They enable extending the product's life through maintenance, repair, refurbishment, remanufacturing, upgrading and reselling (Bakker et al., 2014). Circular products can be physical and virtual (Van Renswoude et al., 2015). The PSS is an alternative to the traditional linear model of buying and owning. Instead of buying and owning, a company offers access to the product, but the ownership belongs to the company. Circular value propositions related to services may also mean transferring their traditional form to virtual services (Van Renswoude et al., 2015).

The distribution channel component includes the important element of virtualisation, one of the key elements of circular business (Lewandowski, 2016). This means that the value proposition can be virtual or the delivery can be virtual. Additionally, selling the value proposition can take place through virtual channels as well as through interaction with customers (Ellen MacArthur Foundation, 2015).

The revenue streams component describes how a company creates its monetary flows (Lewandowski, 2016). It can be based on input, usage, availability and performance, or the value of the retrieved resources. These revenue streams are mainly related to the PSSs. An input-based PSS is, for example, pay-per-product or pay-per-service. On the other hand, the usage-based revenue flow means, for example, pay-per-use – the customer makes a payment when he or she uses the product or service. The availability-based product and services system includes rental based on subscription (a low, periodic fee for using a product or service). It can also be a progressive purchase, which means paying small amounts before the

actual purchase. Finally, the performance-based PSS can be identified. These are solution-oriented (selling a promised level of heat transfer efficiency instead of radiators), effect-oriented (selling a certain temperature level in a building and not radiators), and demand-fulfilment-oriented (selling a promised level of thermal comfort for a building instead of radiators) (Van Ostaeyen et al., 2013). However, revenue streams can also be created by more traditional means by selling only products or services (Tukker, 2004).

The customer relationships component includes issues such as order production, a customer vote (design) and social media marketing strategies, and relationships with community partners (Lewandowski, 2016). Customers can be engaged in two ways – first, in the production of an order, and second, by voting for the products to be made (Van Renswoude et al., 2015).

The customer segment component includes all the segments that can have a different value proposition, depending on the customer relationships and what kind of circular business opportunities businesses offer their customers (Lewandowski, 2016; Pearce, 2009).

The key resources component includes better-performing materials, regenerating or restoring natural capital, the virtualisation of natural materials, and retrieved materials (products, components and materials) (Lewandowski, 2016). There are two types of choices related to the resources. These are input choices and choices related to regenerating and restoring the natural capital. Input choices are concerned with changing the materials required or products. One way of doing this is to use materials or a product that allows closed-loop circular flows (Van Renswoude et al., 2015). Another option is to choose the materials more carefully by using those that are “less harmful to the environment, more feasible to use and has the same or better technical requirements” [El-Haggar, (2007), pp. 27]. Finally, there is also the option of virtualisation (Ellen MacArthur Foundation, 2015).

The key activities component is concerned with optimising performance, product design, lobbying, remanufacturing, recycling and technology exchange (Lewandowski, 2016). For example, improving the equipment can further improve the production process or even change it for the better (El-Haggar, 2007). The key partnerships component deals with cooperative networks and types of partners (Lewandowski, 2016). Circularity is hard to achieve without collaboration (Roos, 2014). The cost structure component is about evaluation criteria, the value of incentives to the customers, and guidelines to account for the cost of the material flow (Lewandowski, 2016). The cost structure is often considered an important implication or benefit of CE. One example is cost reduction related to the PSS (Sivertson and Tell, 2015).

The take-back system component focuses on take-back management, customer relations and channels. This component assumes that all materials could be reused, recycled or remanufactured as many times as possible with close customer management and diverse logistics (Lewandowski, 2016). The take-back system component shares the same core idea as material loops, which are central to the idea of CE (Ellen MacArthur Foundation, 2013).

The adaptation factors component includes organisational capabilities and PEST factors (Lewandowski, 2016). Internal and external factors have been identified as affecting the adaptation of the CE business model. Internal factors are related to the organisational ability to make the transfer from linear to circular. These include change management and team building (Scott, 2015). External factors, on the other hand, consist of the elements of the PEST framework – political, economic, social and technological.

3 Research Methodology and Data

This single case study was based on the case study method (Eriksson and Kovalainen, 2016; Yin, 2014). It included an interview with a representative of a pioneer company in CE within

the Finnish energy sector. The interview comprised two sections. The first section gathered information on the interviewee's background and the awareness, understanding and behaviour, and barriers regarding CE in general and its function within a specific company (Piispanen, Aromaa and Henttonen, in press). The first section also requested the interviewee's opinions on the possibilities and business opportunities presented by CE. The second section focused on gaining an understanding of the CBM. The interview was based on the nine building blocks of the BMC (Osterwalder and Pigneur, 2010). As we later understood, the BMC does not properly reflect the aspects of environment and society, so we considered using two more components – the take-back system and adaptation factors – during the data analysis phase to enhance the results of our case study (Lewandowski, 2016).

The collected data consists of a 31-page transcription of a 90-minute interview with a manager in the pioneer company, and pages from the company's website and other reports. The company was chosen because it is one of the leading pioneers in CE in Finland and we wanted to understand the practices of the CBM. Furthermore, we wanted to research what kind of internal and external factors have been experienced when applying CE to a business model. The interviewee was chosen because of his role in the development of the business model in question and extending its implementation in practice. The interviewee and the company did not permit us to disclose any identifying information, and we have honoured their request. The data was analysed using the qualitative content analysis technique (Eriksson and Kovalainen, 2016).

We started the analysis by reading the verbatim data through several times to detect the interviewee's awareness, understanding, behaviour, barriers, business model and business opportunities regarding CE. Then we proceeded with writing the analytical memos based on the analysis, letting the categories emerge from the data deductively (Eriksson and Kovalainen, 2016). The detailed analysis focused on how the interviewee views the CBM.

The analysis continued by detecting and interpreting the nine building components of the BMC and two extra components – the take-back system and adaptation factors – to construct a coherent value from waste CBM (Osterwalder and Pigneur, 2010; Lewandowski, 2016).

The deductive content analysis process was performed by all three researchers in two phases. First, one researcher conducted the preliminary analysis; and second, two other researchers joined the analysis to gain a deeper understanding and ensure the trustworthiness of the process.

4 Case Study Analysis

The case company has a long history of traditional energy production. It has several business units across Finland, including production and recycling plants. However, in recent years its strategy has shifted towards more sustainable and green business with CE as its spearhead model. This business model provides an opportunity to create value for customers in environmental services and waste solutions. The core of the business is services such as material recycling and water and soil treatment, and the company customises its services based on customer preferences. One important aspect of the business model is that the company can become part of its customers' businesses, either through the value chains or through the production processes. Furthermore, the business model gives the company an edge over its competition because it has the possibility and resources to invest in CE operations and it has gained experience in CE businesses. Therefore, it has been able to increase its competitiveness and efficiency.

The interviewee understands CE as a form of material circulation in closed loops, in which materials create value throughout their life cycles and can be used again to create something new, such as different products. The interviewee stated that “one person's waste

could be the start of someone else's business." Thus, they see excess material as a business opportunity. The interviewee also believes that CE is the only way to go, stating that:

"Our planet will not survive if we don't act now, and all of us must pay more attention to our natural resources because they are limited. For example, population growth demands increasing resources each year."

The interviewee cited CE as one solution for resource efficiency and sustainability. Regarding the company, the interviewee stated that it has been at the frontline of CE for a few years. The company officially published its CE strategy in February 2016 and is now thriving with the core business logic of CE. The interviewee sees that the awareness of CE and opportunities for value creation is evidently high in its business and in general. They believe that someone must lead the way, and their company has taken that lead. The company also provides education, courses and other materials to its employees so that everyone can gain an understanding of CE as well as its implications and opportunities. The interviewee also clearly understands that economic reasons still lie behind all business transactions, but sustainability and green values are increasingly valuable for businesses. Thus, this represents one of their value propositions and value-creation opportunities. The overall corporate strategy leans towards CE and sustainability.

4.1 Value proposition

The company's value comes from economic and reputational factors. It provides solutions for customers who are part of the supply chain; thus, it acts as a partner in the customer's value chain. In addition, it offers services that create value for the customer, such as waste management, circular resources such as ash, plastic, oil, metal, etc., environmental building, and consultancy in environmental and sustainability services. The company creates value from its customers' waste and other excessive materials, and thus services are at the core of

its CBM (De Jong et al., 2015; Lewandowski, 2016). Furthermore, it is constantly pushing its business to be more service-oriented, and it is actively seeking new opportunities and ways to create more value for the entire value chain with its customers.

4.2 Distribution channel

Direct sales are the best method for distribution, and this is what the company practices. CE is not well-known and waste management opportunities have not yet been explored, so efficient direct sales and marketing are key functions. In many waste management cases, the company can offer a solution using direct sales, which includes increasing awareness of CE. Distribution channels are tightly connected to the value proposition in the CBM (Lewandowski, 2016). The case company is utilising digitalisation in its services, and thus the interaction with customers is providing more efficient ways for value creation.

4.3 Revenue streams

The value from waste CBM employed by the company suggests that most revenue comes from its core business of waste management solutions and environmental services. The company has fixed revenue streams from some waste solutions customers, while other revenue streams are from individual consultancy projects with the customers (see traditional revenue streams; Tukker, 2004). The revenue model involving some of its larger customers is based on partnership, in which it is part of the supply and value chains (see solution-oriented revenue streams, Van Ostaeyen et al., 2013). The company also has a growing operation in recycled materials, in which certain waste products (primarily plastics) are purchased and processed into pellets. The pellets are then sold to other companies that manufacture new reusable products.

4.4 Customer relationship

The company's customer base is very broad, though the management team clearly understands the end users' needs. The company has achieved a lasting, positive reputation,

and its services are therefore in high demand. It also aims to build long-term business relationships. The management team also believes that CE is one of the key solutions for creating a sustainable economy, and therefore the company offers partnership solutions in waste management. The company's customers consist of very small companies and large international companies, and this enables it to have different strategies for marketing and customer relationship management.

4.5 Customer segment

The company has several important business to business (B2B) customers. Regarding the value from waste CBM, its customers include municipalities and waste management companies. The most important customer segments are in the plastics, forestry, metal and chemicals industries. It can handle basic community waste and hazardous waste, and thus it has different customer segments based on the waste and excessive materials they produce. The case company has several segments, and therefore it has different strategies and value propositions for them. In addition, it can offer long-term value and commitment to the circularity of its connected value chains.

4.6 Key resources

The most important resources the company has are knowledge and its CBM. It is ahead of its competitors when it comes to CE business knowledge; after implementing the CE strategy, additional business opportunities have been created. At the same time, there are some resource issues which have been identified, and the company is taking actions to overcome these knowledge barriers, including digitalisation, artificial intelligence and machine learning. Key resources also include advanced technology and state-of-the-art facilities, especially in waste management. In addition to the above, the company has access to better-performing and more valuable materials, such as plastics (Lewandowski, 2016). The

company has clearly chosen a closed-loop circular flow of materials (Van Renswoude et al., 2015).

4.7 Key activities

The company's key activities are related to waste management, including all the key facilities and processes that support the core business. It invests heavily in innovative technology to increase the efficiency and profitability of its waste management solutions (El-Hagggar, 2007).

The business portfolio is structured based on long-term business relationships, although it engages with its different customer segments and invests in its customer relationship management to provide better services and value-creation opportunities.

4.8 Key partners

The company has a wide network of key partners and suppliers. It works in close collaboration with environmental and waste management companies. In addition, it has an extensive subcontractor network, which presents a valuable factor in its core business and creates a win-win situation for every actor in its value chain. With the subcontractors, it engages in circular sourcing of waste and excess material, which is later converted into energy, new raw materials or new products. The case company heavily endorses its partnerships. Even its core business is to connect customer businesses to its business, thus creating a solid value chain with close collaboration (Roos, 2014).

4.9 Cost structure

The cost structure consists of personnel costs (many highly-skilled specialists in CE and environmental issues) and large investments in advanced technology and state-of-the-art facilities. The case company uses strict evaluation methods, and it has the possibility to offer incentives to smaller businesses to engage in closer collaboration with them. For the case company, the cost structure also means that it must be agile in its circular business, and thus cost efficiency, material efficiency and overall production efficiency are closely monitored.

4.10 Take-back system

The case company engages in both biological and technical nutrient loops. As its core business involves environmental services and waste management, the activities of cascading nutrients and reuse, redistributing and recycling technical nutrients are possible with reverse logistics and close partnerships to make the material flow in the entire supply and value chain efficient and feasible.

4.11 Adaptation factors

The case company has been moving towards a new organisational culture where CE is the spearhead of its business. Its personnel have been going through knowledge and education procedures, and its human resource management has concentrated on team building. It has acknowledged the importance of change management when applying CE to the business model. That process is still ongoing, and it has been evaluating the impact of the changes made in the organisation.

The external factors consist of political, economic, sociocultural and technological factors. Politics and legislation are connected to the transition from linear to CE, i.e. possible incentives, and therefore the case company has been active in those settings to pursue a political environment to become even more attached to CE. The case company has been investing heavily in the latest technology; and thus, for its part, it is making the change more visible. Socioeconomic and sociocultural issues, such as customer behaviour, changes in the understanding and valuation of natural resources, ethical issues and so forth, change the demand for more renewable and reusable products.

Furthermore, the environmental values were built into the CBM, which is evident from the green values that comprise the brand, and the marketing, sales and other key activities are related to the brand. The company's societal values, benefits and impacts come

from its growing CE operations, which increase sustainable consumption as awareness of CE rises, therefore reducing environmental and societal impacts.

5 Discussion

Our analysis of the CBM depicts a pioneer company that operates in the energy sector with CE as its strategic focus. We propose that the CBM is a multifaceted phenomenon, and a commitment to the organisational culture, cooperation and the service business could be the key components.

This study contributes to previous research, first by illustrating that value from a waste CBM in our case is very much based on services, and the development and implementation requires an organisational culture change and investments in personnel education and commitment (Bocken et al., 2016; Lewandowski, 2016). In the case company, the organisational cultural change and commitment were the key factors, which was evident in the investments in personnel education and training. Second, the CBM is connected to different actors in the value and supply chains, and the change from a linear to a circular business is strategic as in this company the focus shifted towards CE (Roos, 2014). Third, this study demonstrates that concentrating on biological and technical nutrients can be done efficiently with reverse logistics (Govindan, Soleimani and Kannan, 2015). The case demonstrates that reverse logistics is one of the most important factors when implementing CBM. This means, especially in this case company, that a service business could be implemented. This study also illustrates how the company has adapted to the change from a linear model to a CBM, which has required new education, investments in technology and concentrating more on the service business. The external, political, economic, sociocultural and technological factors have all had an impact on the application process (Lewandowski, 2016).

The case company decided to move towards sustainable business practices a few years ago, and that strategic decision has proved to be the right move. The strategy was to invest in technologies and processes that create minimal waste, thus allowing waste to be used as energy or in new products and innovations. The CBM clearly focuses on customer value, as the company provides solutions and services that its customers need. It also offers partnerships for its customers so that they become a part of their entire value chain (De Jong et al., 2015). This is the key benefit of the CBM in this case, due to close collaboration and understanding its customers. In addition, the value from waste CBM is disruptive and innovative, thus providing the company with a competitive advantage among CE businesses (Boons et al., 2013). The environmental and societal effects of CE are evident in the case company – the more it engages in CE with its customers, the more it circulates waste (even hazardous waste). With its high brand value, the company can promote awareness of CE, which will eventually lead to effective business practices or customer activities and less impact on the environment and society (Baldassarre et al., 2017).

The case study showed that the BMC was particularly helpful when analysing the CBM. The BMC forced the researchers to systematically examine the building blocks of the CBM, and the analysis itself was iterative (Niskanen, Piispanen and Montonen, 2017). The BMC was extended by using two more components: the take-back system and adaptation factors (Lewandowski, 2016). Furthermore, some BMC components seemed to be key to the CBM. These components include the value proposition, i.e. how to create value in CE through partnerships and close collaboration. The distribution channel (efficient logistics) increases profitability and value creation. Key resources (CE business) require advanced technology and highly-skilled personnel and key activities – state-of-the-art facilities, direct sales and brand value – and these components were connected to the take-back system and adaptation factors (Lewandowski, 2016; Osterwalder and Pigneur, 2010).

6 Conclusions and Implications

This single case study focused on the CBM, illustrating one such model in a pioneer company in CE. In this paper we aim to provide answer to the question of how a company converts its resources and capabilities into economic value by creating value from waste. Firstly, this study adds new knowledge to the body of research on business models, especially regarding CBMs, by providing a real-life case of a pioneering company engaged in CE business.

Second, the CBM is very much based on services, and its development and implementation is an organisational task involving investments in education and commitment. Third, the CBM is a network of actors in both value and supply chains. Fourth, biological and technical nutrients can be utilised with reverse logistics.

The case company manages its CBM through its strategic focus on increasing brand value and creating value for the company, customers, the environment and society. The CE business requires certain value propositions, efficient distribution channels (and overall logistical efficiency due to a large number of materials involved), key resources and key activities. The case company has integrated CE and sustainable practices into its existing value from waste CBM.

The theoretical implications of the study focus on understanding the CBM, which suggests that value creation is also an opportunity on environmental and societal levels. Although the CBM must be viable and profitable, it contains more green values that can create value within a broader context. CBMs offer the potential for value creation in businesses across different sectors. The case company, for example, has an extensive customer base, a pool of subcontractors and distribution and logistics partners, thus creating opportunities to create value throughout the entire supply and value chain. The practical implications of the study are related to the managerial level. This study offers new information to managers planning their businesses by providing them with a benchmark

study, i.e. an illustration of doing CE business in the Finnish energy sector. To strengthen this research, studies on how to transform a traditional linear business model into CBM are called for.

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