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Circular Entrepreneurship in a Cradle to Cradle inspired start-up

An in-depth look at the motives and challenges associated with the implementation of a circular business model in Zambia

by

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Abstract

This study examines the implementation of circular economy principles in a company operating in a developing country. Focus is put on the start-up phase of the company, where we seek to understand the entrepreneurial motive behind implementing circular, sustainable practices in the infant stage of the company. Furthermore, the methods used to construct a circular, sustainable business model are investigated and contrasted to the current literature on such practices. Relevant literature within the sphere of the circular economy and sustainability is introduced to enable for an in-depth understanding of these relatively new concepts. Current research on business model innovation and related sustainable and circular business model frameworks is discussed. Also, the novel research field of circular start-ups is presented. Up until now, current research is found to primarily focus on the implementation of circular economy principles in incumbents. Moreover, research is found to be lacking on the transition towards a circular economy in developing countries. We therefore conduct an in-depth, qualitative single-case study on clean energy company *Emerging Cooking Solutions* operating in Zambia to provide the field with knowledge about the implementation of circular practices in a developing context. Our findings show that these entrepreneurs adapt a holistic approach to the construction and purpose of the business model. Furthermore, we propose characteristics specific to circular start-ups. Lastly, the financial challenges connected to the implementation of circular business models in the developing context are discussed, and recommendations for future research into new financing methods are proposed.

Keywords: circular economy, circular business models, sustainable development, circular start-up, clean cooking, cradle to cradle, industrial ecology

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Abbreviations

C2C	Cradle to Cradle
CE	Circular Economy
CBM	Circular Business Model
CSU	Circular Start-up
IE	Industrial Ecology
IS	Industrial Symbiosis
RC	Resource Cascading
SBM	Sustainable Business Model
WaR	Waste as Resource

1 Introduction

1.1 Background

The world is in a critical state of transformation. Ever since the industrial revolution human activity has crippled the functioning of earth's ecosystems (WBSCD, 2021), with human resource demand overshooting the carrying capacity of the biosphere since the 1980s (Wackernagel, Schulz, Deumling, Linares, Jenkins, Kapos, Monfreda, Loh, Myers, Norgaard & Randers, 2002). Moreover, global inequalities are increasing (OECD, n.d.) and the world's poor are largely dependent on the services provided by ecosystems for their livelihoods (Kempf, 2018), making these groups especially exposed to the adverse effects of climate change. Issues such as e.g., increasing resource scarcity, greenhouse gas emissions, and loss of biodiversity are prompting politicians, business leaders, academics and many more to rethink the relationship between human society and the environment. One of the most prominent blueprints for this transformation is The United Nations "2030 Agenda for Sustainable Development" (UN, n.d.). It was adopted by all UN member states in 2015 and is an "urgent call for action by all countries' to, among other goals, combat climate change, poverty, and advance health and education worldwide.

The Circular Economy (CE) concept has recently been gaining traction amongst policy makers, business leaders, and within academia as a way to concretize the necessary steps towards sustainability. In its essence, CE is a response to the predominant linear production and consumption paradigm, in which resources are discarded at the end of their life-cycle, resulting in an unsustainable level of resource consumption. The main CE principles revolve around "designing out waste and pollution, keeping products and materials in use, and regenerating natural systems" (Ellen MacArthur Foundation, n.d.). The concept will be further expanded upon in the literature review.

Such a systemic change naturally requires the involvement of a variety of societal actors, ranging from politicians to academics and the business sector. Recently, the latter of these actors have been highlighted as playing a key role in the transition towards a circular economy (Ghissellini,

Cialani & Ulgiati, 2016; Lieder & Rashid, 2016; Ellen MacArthur Foundation, 2015). This is perhaps not surprising, as it is primarily the business sector that drives resource extraction and consumption. Circular business models (CBMS) which incorporate the principles of CE are increasingly researched and emphasized as fundamental to provide solutions to the above mentioned complex of problems in the relationship between human society and the environment (Henry, Bauwens, Hekkert & Kirchherr, 2020; Bocken, de Pauw, Bakker & van der Grinten, 2016; Ghissellini et al., 2016).

1.2 Problematization

As highlighted by the previous section, a move away from business-as-usual is necessary to enable sustainable development. Circular economy and circular business models are increasingly discussed as concepts that can further this transition, however due to the novelty of the concepts and the short timeframe in which the implementation of these principles have been studied, several definitions of CE exist (Kirchherr, Reike & Hekkert, 2017). Moreover, most research on CBMs have been concerned with studying incumbents, that is companies with linear business models that are seeking to become more sustainable with the intemplementation of CE principles (Bocken, Paavo & Pontus, 2017; Stewart & Niero, 2018; Frishammar & Parida, 2019). As discussed by Henry et al. (2020), these companies might find it difficult to incorporate some of the more radical shifts that CE demands since they are "locked into previous investments, existing supply chains and business models that are hard to adapt once fully developed" (p. 2). A possible pitfall of this research trend is that e.g. recycling, one of the most commonly applied sustainability strategies in incumbent companies (Bocken et al., 2017), is interpreted as sufficient enough for sustainable development, as it is one of the least impactful CE principles (Reike, Vermeulen & Witjes, 2018). Furthermore, Henry et al. (2020) argue that more research must be directed toward start-ups that incorporate CE principles from their inception, as these are more apt to "adopt more disruptive circular business models" (p. 2).

Another aspect that was briefly touched upon in the introduction is the issue of poverty in relation to climate change and resource depletion. To the best of our knowledge, no research has been carried out on circular start-ups (CSUs) in developing countries. The importance of

addressing this research gap cannot be underestimated. The sustainable development goals are aimed at "creating a better and more sustainable future for all" (UN, n.d.). Proponents and researchers of the circular economy should not overlook the potential that these concepts could have in empowering people living in poverty. Climate change is viewed as potentially detrimental to decades of poverty reduction measures, as poorer countries depend to a higher extent on natural resources and are less capable of coping with climate variability (OECD, n.d.). Water scarcity, food security, health-related issues and reductions in economic growth are some of the most severe issues highlighted by the OECD (n.d.) in connection to increased climate change. If CE is to be the proposed pathway toward sustainability, the motives, and challenges to the implementation of these principles in the developing world must be researched to enable policy makers, business leaders, and other actors to make the best decisions moving forward.

One of the most pressing issues facing developing countries is the negative social, environmental and economic impact of hazardous cooking methods (Clean Cooking Alliance (CCA), n.d.). According to the World Health Organization (2018), approximately three billion people cook using open polluting fires or inefficient stoves, with close to four million people dying prematurely every year due to household air pollution from these inefficient cooking practices. Moreover, women and girls are disproportionately exposed to these hazards due to being chiefly responsible for the collection of fuel and cooking (CCA, n.d.). Information gathered from the website of the CCA shows that a quarter of black carbon emissions, the second largest contributor to climate change after carbon dioxide, is released as a result of these cooking practices. Furthermore, approximately 30% of the most frequently used fuel woodfuel is unsustainably harvested, which results in forest degradation, with subsequent losses of biodiversity, flood protection, and increased erosion. The World Bank states that these practices cost more than $2.4 trillion per year, and estimates that $10 billion are needed annually to provide universal access to healthy, affordable cooking solutions (World Bank, 2020). To realise these goals, the CCA works with a global network of public and private actors to make clean cooking accessible to these marginalized communities. Using a qualitative approach, we study the implementation of CE principles in CCA partner *Emerging Cooking Solutions,* a circular business operating in Zambia to provide clean energy solutions.

1.3 Research Purpose

The aim of this study is to provide further insight into the implementation and theoretical background of the Circular Economy, Circular Business Models, and Circular Start-ups. Furthermore, we aim to illuminate some of the specific challenges experienced when executing these strategies in developing countries as a CSU by an in-depth case study of a clean energy company operating in Zambia. By doing so, we hope to provide the research field, business leaders, policymakers, and other stakeholders with a renewed and enhanced understanding of the above mentioned concepts in this specific context. Based on the aims and objectives of this study, the research questions has been formulated as follows:

RQ1: *What are the entrepreneurial motives and methods used when implementing circular economy principles in a start-up?*

RQ2: *What are the main characteristics of circular start-ups?*

RQ3: *What are the perceived challenges of implementing such a business strategy in a developing country?*

1.4 Thesis Outline

This thesis is organized into five main chapters. In Chapter 1, an introduction to the topic and an initiation of the research purpose is made. Chapter 2 examines a set of research bodies within the field of Circular Economy and other related concepts such as Cradle to Cradle, Industrial Ecology as well as the applied sustainability concepts within business models. The theoretical framework is constructed for both established and more novel relevant research areas to be used to explain and understand the results of the case study. Chapter 3 presents the applied methodology of the research process and our knowledge building. Chapter 4 analyzes the findings of the case study which will, finally, be concluded in Chapter 5 together with the theoretical framework, followed by research implications, and recommendation for future studies.

2 Literature Review

The literature review provides an overview of selected research in areas relevant to the Circular Economy. As this topic has grown in popularity in recent years, accredited authors with relevance to the research topic, and with a high citation frequency, were chosen as primary source of theories for the literature review. The literature used to build the theoretical background was obtained through Lund University database LUBsearch and Scopus. It was further followed by data collecting in open access channels such as Google Scholar and on relevant websites.

2.1 Circular Economy

Several authors ascribe the concept of Circular Economy (CE) to Pearce and Turner (1990) with the publication of their book Economics of Natural Resources and the Environment (Ghissellini et al., 2016; Andersen, 2007; Geissdoerfer, Savaget, Bocken & Hultink, 2017). In the chapter named 'The Circular Economy', the authors seek to expand the view of the economic system by including the economic functions provided by natural systems. They point to three important economic functions of the environment: it serves as an input of resources into the economic system, it functions as a waste assimilator, and it provides direct utility as a source of aesthetic enjoyment. As explained by the authors, these are all components of the overarching function of life support. To date, they argue, no economic system has managed to provide solutions that allow for the economy and the natural systems to exist in equilibrium. The authors promote the change towards business actions which have sustainable development as the main objective. Further, they criticize neoclassical economics for the negligence of the environment, by viewing nature as a means to an end, as well as disregarding the well-being of non-human creatures and future generations. The proposed solution looks at the resources available and categorizes them as renewable and nonrenewable, where the sum can never go below zero between usage and regeneration.

Pearce and Turner's (1990) reasoning was based on concepts introduced by ecological economist Kenneth E. Boulding in the 1960s (Ghissellini et al. 2016). Boulding (1966) differentiated

between the open and closed economy, arguing that the coming "spaceman economy" (p.4), in which the earth is regarded as a closed system with a set limit of resources, both in terms of extraction and pollution, would challenge and change the more common open, linear view of the economy and its principles. Most notably, in the traditional view, production and consumption are regarded as positive, as the "success of the economy is measured by the amount of … throughput from the 'factors of production'" (Boulding, 1966, p.4). However, when faced with a limited number of resources, Boulding (1966) argued that the main concern is with stock maintenance, that is, to enable the continuous prosperity and diversity of the total capital stock of the economy. Hence, production and consumption would preferably be minimized (Boulding, 1966). These foundational ideas lay at the core of CE, with several other schools of thought contributing to and advancing the concept continuously.

In contrast to the perspective of the planetary macro environment as a closed system, CE studies aim to approach actors, such as organizations, as open in nature (Ghissellini et al. 2016). Stemming from the field of General Systems Theory, this view argues for the importance of analysing the interrelation of the various components that make up a system, rather than approaching them in isolation (Lázló, 1972 cited in Ghissellini et al. 2016). This holistic approach echoes throughout several central concepts within CE, such as Cradle to Cradle (C2C) (Braungart & McDonough, 2002), Industrial Ecology (IE) (Erkman, 1997), and Resource Cascading (RC) (Sirkin & ten Houten, 1994).

Heshmati (2017) points to the rising popularity of CE as a path toward sustainable development, as more countries implement the related practices into their policy frameworks. As explained by the author, among the first countries to introduce CE principles on a national level were Germany, Japan, Sweden, and China, where promising results have been obtained. The author also highlights the work of the European Commission to further the transition toward CE on an international level. The incentives for transitioning toward a CE concern multiple dimensions, as it can provide economic, social, and environmental benefits (Su, Heshmati, Geng & Yu, 2013). As explained by Su et al. (2013), the social context could benefit from sustainable economic growth and lower unemployment rates to improve quality of life; economically, higher efficiency in resource utilization could result in increased competitiveness; environmentally, the application

of CE practices within industry could reduce negative externalities. As its principles address both production and consumption procedures, CE is perceived as a unique instrument to, amongst other things, combat resource depletion and waste generation (Su et al. 2013).

In this paper, the definition of CE proposed by Kirchherr, Reiki and Hekkert (2017) is applied, which holds that CE is "an economic system that replaces the 'end-of-life' concept with reducing, alternatively reusing, recycling and recovering materials in production/distribution and consumption processes. It operates at the micro level (products, companies, consumers), meso level (eco-industrial parks) and macro level (city, region, nation and beyond), with the aim to accomplish sustainable development, thus simultaneously creating environmental quality, economic prosperity and social equity, to the benefit of current and future generations" (p. 229).

2.1.1 Recycle, Reduce and Reuse

A large part of CE when it comes to the environmental impact is waste management and its policies, while they may differ between nations, a general consensus is still reached (Sakai, Yoshida, Hirai, Asari, Takigami, Takahashi, Tomoda, Peeler, Wejchert, Schmid-Unterseh, Douvan, Hathaway, Hylander, Fischer, Oh, Jinhui & Chi, 2011). In the paper from 2011, Sakai et al. explain how policies are seen to be both viable and effective in their way of managing waste by having three principles; 'recycle', 'reduce'; and 'reuse'. Collectively, these are more commonly known as 3R. Initially, waste management regulations put firm constraints on remains from industries, through allocating a 'producer responsibility', leading to higher consciousness of waste disposal (Sakai et al. 2011). These actions were coupled with the development of specific collecting stations, making it easier to dispose of environmentally unfriendly materials, and thus encouraging recycling for a longevity of materials to be extended.

In theory, recycling is perceived to be good, a hypothesis was supported by Catlin and Wang (2013), that when the option of recycling was available; less material conservation occured, than when the option of recycling did not exist. This brings the perspective that recycling is necessary when such materials are already in circulation, but highlights the question of what about when new raw materials are introduced? This corroborates with the higher propensity in findings of research where newer published papers drop one of the R's in 3R to 2R. Similarly, in a more

recent paper of the lead author Sakai, who first utilized the 3R in his 2011 paper, to then use 2R in the 2017 paper. The focus has turned away from ‘recycle’ as ‘reduce’ and ‘reuse’ have become a higher priority (Sakai, Yano, Hirai, Asari, Yanagawa, Matsuda, Yoshida, Yamada, Kajiwara, Suzuki, Kunisue, Takahashi, Tomoda, Wuttke, Mählitz, Rotter, Grosso, Astrup, Cleary, Oh, Liu, Li, Ma, Chi & Moore, 2017). Sakai et al. (2017) continues by explaining that it is questionable if recycling promotes waste prevention. Therefore, it is important to steer towards less waste creation through innovativeness and technology of which has a higher efficiency, allowing for less demand for resources (Wackernagel et al. 2002).

When production becomes efficient, the energy and virgin materials used can be minimized (Heshmati, 2017). The second R is ‘reduce’, where the product manufacturer receives the responsibility to oversee its production processes to lower the initial use of natural resources and materials but also to ensure that the lifespan of products is prolonged (Kirchherr, Reike & Hekkert, 2017). As the trend today is a shorter product life span, due to fast switching demands from customers, innovative improvements in technology is going towards adapting end-of-life practices at a low cost (Carmen Ruiz, Cazorla, Cuartero & Macia, 2009). However, according to ‘reduce’, this is a step in the wrong direction, where emphasis is no longer put on long term quality but on quick and cheap production. Kirchherr, Reike and Hekkert, (2017) add that industries may choose to implement certain aspects of CE, such as improving their recycling, without adding the other crucial parts as well. In these instances, the firm gives the impression of circularity but without reduction as a priority, they do not have an incentive to radically convert into a system which produces products with a long life span, using less resources. This is a widespread problem when conceptualizing CE, as “Practitioners frequently neglect ‘reduce’ in their CE definitions, though, assumingly since this may imply curbing consumption and economic growth.” (Kirchherr, Reike & Hekkert, 2017, p.229). The authors continue by emphasizing the fact that cases of good implementation are needed to strengthen the position of ‘reduce’.

The part of ‘reduce’ that mostly relies on the enterprise level is within energy conservation, where such conservation is especially important for developing countries (Li, Bao, Xiu, Zhang & Xu, 2010). In a case study, Li et al. (2010) study a developing country's dependence on energy

and its impact on the environment. The theory corroborates with previous finding on ‘reduce’ (Kirchherr, Reike & Hekkert, 2017), where the reduction is aimed at energy, material and waste minimization throughout the product life span, however the difference from this perspective is that while Kirchherr, Reike and Hekkert (2017) had an overview of an international level of how concepts were applied theoretically, Li et al. (2010) has a practical view and includes consequences long term. In the developing country, brought up by Li et al. (2010), the pressure lay on energy conservation from the start as this high consumption at the developing stage will only increase as the country moves towards becoming a developed country. Therefore, the developing country will risk facing shortages if it does not implement a CE already at the developing stage, through energy efficiency at enterprise level (Li et al. 2010).

The last R in the 3R is ‘reuse’, where the aim is to close the product loop of which one way is eliminating hazardous materials that impair reusage (Ellen MacArthur Foundation, 2013; Kirchherr, Reike & Hekkert, 2017). By using raw materials and a design process that conforms to CE principles, the ‘reuse’ happens by adding an additional circle to the traditional linear consumption model, source separation, which adds an additional product processing step after the end-of-life (Song, Li & Zeng, 2015). Where in linear processes, Song, Li and Zeng (2015) explain how the product would at this stage end in a landfill or similar, however, adding this additional source separation allows for a re-looping and further consumption of the same materials. The authors conclude that a reusage of a product and materials is less energy consuming than recycling. This ’reuse’ is interconnected with waste management’s ‘zero waste’ by preventing the accumulation of waste initially formed through reusing, repairing and remanufacturing existing products and thus not letting anything out of the loop to become waste (Song, Li & Zeng, 2015). However, Song, Li and Zeng (2015) also underline the limitations of reusing; “it has the limits of thermodynamics, which state that totally closed cycles are not possible, losses are bound to occur if energy resources are limited.” (p.209) and therefore agreeing with previous statements that the solution relies on going back to the source of waste prevention utilized in ‘reduce’.

2.1.2 Cradle to Cradle

An important contribution to CE is that of C2C, a design-based approach introduced by Braungart and McDonough (2002) to further the efforts to close the material loop. They argue that the common 3R-principles of CE; recycle, reduce and reuse still promotes a cradle-to-grave manufacturing model that eventually results in waste and pollution. Therefore, it is in the design process of products and industrial systems that a circular perspective must be applied to enable a perpetual flow of biological and technical nutrients (Braungart & McDonough, 2002). The authors divide material flows into these two separate cyclical systems due to necessity; some products can be designed and produced to safely decompose and re-enter the ecosystem, being made up of biological nutrients; others, such as televisions and smartphones, contain materials that are not biodegradable and must therefore be kept in a separate system. These products are to be designed to be disassembled, thus enabling them to re-enter manufacturing processes and subsequently resulting in a decrease of the extraction of raw materials and an increase in economic efficiency (Braungart & McDonough, 2002). To summarize, the philosophy of C2C challenges the notion of waste and urges producers to envision the total life cycle of a product in the design stage.

2.2 Industrial Ecology

The field of IE has emerged to provide an operational approach to sustainability by reconceptualizing industrial society (Erkman, 1997). Rather than viewing industry and the environment as separate entities, the former being the source and the latter the receptor of environmental impact (Ghissellini et al., 2016), industry and the environment are viewed as part of a single ecosystem (Erkman, 1997). The goal of IE is for industry to be "restructured to make it compatible with the way natural ecosystems function" (Erkman, 1997, p. 1), with initiatives such as eco-industrial parks where one company's waste becomes the input of another company, or strategies for the optimization of resource productivity. As such, IE is concerned with analysing and improving material flows within the industrial society (Erkman, 1997).

There are overlooked complexities which affect the favorable results in application of IE in society (Campbell-Johnston, Vermeulen, Reike, & Brullot, 2020). According to Vermeulen (2006), there has been an insufficient amount of research into the societal perspective of IE, “This is actually a remarkable situation, as the very core subject of industrial ecology is the redesign of society, originally inspired by ecosystem metaphors!” (p.575). He then compiles typical modes of how IE should be applied into the society. These include; “redesign of production processes”, where the emissions from production should aim to be the lowest possible, preferably zero emission; “redesign of the full life cycle of products" where people’s demand should not cause concern through “(re)design of the built environment” where infrastructure with low repercussion is created; “creation of recycling systems" that promotes material cycling; Implementing and making of “regional networks of material exchange”; and lastly “redesign of society’s energy system” where renewable sources are prioritized (p.577).

2.2.1 Resource Cascading

Due to volatile resource prices, climate change, and increasing resource scarcity, there has been a growing interest in methods of increasing resource efficiency and the possibility of turning waste into resources (European Commission, 2014). RC has emerged as one method to address these issues, wherein biomass is used and reused in successive steps throughout its life cycle (Bais-Moleman, Sikkema, Vis, Reumerman, Theurl & Erb, 2018). In their study of the European wood sector, Bais-Moleman et al. (2018) investigates the untapped potential of cascading use of woody biomass in reducing the sector's environmental impact. In the case of wood, cascading implies that virgin wood fibre is first used in higher-added value products, and then recycled into the production of e.g., particleboards, to lastly be utilized as energy through the production of e.g., wood pellets (Bais-Moleman et al., 2018). Although some uncertainty is expressed, the scenario analysis conducted by Bais-Moleman et al. find that optimized RC could decrease greenhouse gas emissions by 52% in the sector when compared with no cascading. However, the success of cascading is dependent on building partnerships and networks to enable the construction of new value chains (Bais-Moleman et al., 2018; Carraresi, Berg & Bröring, 2018). As such, efforts to foster industry collaboration and assisting policy implementation is necessary for the development of future RC undertakings.

Sirkin and Ten Houten (1994) first introduced cascading in their paper as an instrument for maximizing resource utility. They constructed a model that evaluates the cascaded resource from different dimensions; the structure of the compound and its use as well as quality and efficiency; the time period of which the compound can be utilized; how well the compound can be reused; and lastly how much of the compound is demanded as well as its availability. Depending on the score of the abovementioned dimensions, the efficiency of cascading is measured to explain whether or not cascading is appropriate (Sirkin & Ten Houten, 1994). Kim, Hwang and Lee (1997) further developed these measures to include aspects of quality and quantity of the material used.

To allocate this RC system, there needs to be a reasonable justification to use the particular material, that the quality will not degrade rapidly, and that the negative consequences stemming from the quantity of materials demanded does not exceed the environmental gains from RC (Kim, Hwang & Lee, 1997). Therefore Kim, Hwang and Lee (1997) propose a holistic view of RC designed to each individual case to assess the efficiency and viability of such uses. The aspect of quality was also widely discussed by Sirkin and Ten Houten (1994), where they underline the appropriateness of different materials and different uses. They describe how high quality materials should never be put into a cascading system which demands low quality materials, but should be reserved for high quality demanding performances through a sort of re-linking into an alternative value chain.

Another dimension of Sirkin and Ten Houten's (1994) work concerns consumption and extraction, which aligns with research on energy conservation (Li et al. 2010). Similarly, they seek to balance resources demanded and resources supplied, from a future generations' perspective. Today's consumption needs to be augmented to support future needs by resource life span extending systems, such as cascading, or by assessing the appropriateness of using chosen material through a holistic view by only depleting resources for higher quality products (Campbell-Johnston, Vermeulen, Reike, & Brullot, 2020; Kim, Hwang & Lee, 1997; Sirkin & Ten Houten, 1994; Li et al. 2010).

It is very important to note the differences between RC and 'reduce', stemming from CE's R frameworks (Campbell-Johnston et al. 2020). While at later stages, when comparisons were

made between different theories on the 3R uses in CE, and there was a overall common consensus on the ‘recycle’, ‘reduce’ and ‘reuse’; such consensus was not found in other aspects (Kirchherr, Reike and Hekkert, 2017). The results varied from 2R, to 3R, to 9R (Kirchherr, Reike and Hekkert, 2017) and some had even more, in addition, the majority of those R frameworks corresponded with RC processes; except for ‘reduce’ (Campbell-Johnston et al. 2020). This is explained by, as previously mentioned, that ‘reduce’ stems from maximal energy utilization from resources, while RC aims for resource maximization from as little energy as is appropriate.

Campbell-Johnston et al. (2020) propose that ‘reduce’ is still applicable in RC at the designing phase of the product, even if it is not thoroughly covered in existing research. They also criticize the ‘reuse’ principle on not covering dimensions of quality upcycling at each stage and therefore further strengthening the differences between the circular perspective of the R frameworks; a product value pathway, and the cascading perspective; the ‘highest’ product value pathway. Where the authors further motivate that in a CE perspective, the stance of a resource downcycling is more common, and to incorporate RC into the R frameworks, several dimensions which are lacking in today’s CE needs to be taken into account. Campbell-Johnston et al. (2020) propose those dimensions to be “Monetary value” and “Quality and functionality” of the resources as well as the “steering framework” which is validated and based on “People, Planet, Prosperity” (p. 9). Together they result in an appropriate allocation of resources; the absolute exploitation of all uses in a product; and having a long term strategy, for not limited to, but including ecological threats and the socio-economic environment.

2.2.2 Waste-as-Resource

The concept to increase resource efficiency does not only concern the products in circulation, but has also reached waste management and the notion of recovering energy and new uses from waste, more commonly known as Waste-as-Resource (WaR) (Huysman, Sala, Mancini, Ardente, Alvarenga, De Meester, Mathieux & Dewulf, 2015a). Huysman et al. (2015a) explains that the focus has shifted from waste disposal to seeing waste as a possible new resource, where they conducted a case study analysing natural resources to resources coming from waste.

Regulations can pose a barrier by incorrectly classifying material as waste instead of a by-product. The economic benefits can at a first glance seem very positive when it comes to reselling waste and escaping waste management costs. However, at a second glance this incentive for waste reselling has reached a failing point, where regulation inhibits innovative motions of repurposing when waste disposal operations need to follow a very specific process (Chertow, 2004). When a product is classified as a hazardous waste, it is prohibited from recycling and reusing which in turn obstruct symbiotic relationships, thus intervention from public institutions is a necessity (Gibbs & Deutz, 2007). In this situation, a waste reclassification needs to occur to shift the public institutions from being a barrier to an enabler (Vladimirova and Miller, 2020).

The resources can be classified accordingly to a closed or open loop system (Paraskevas, Kellens, Dewulf & Duflou, 2015) Where the closed loop system recycles the same material without the large loss of material quality, such as with metals, and the properties of the recycled waste materials are not different from the raw material and thus can be used interchangeably as a resource (Williams, Heidrich & Sallis, 2010; Paraskevas, Kellens, Dewulf & Duflou, 2015). Applying the concept of cascading, it would mean that it is the most appropriate to use the WaR approach in a closed loop system because the utilization of the waste product is higher and it does not make sense to use raw material in such cases instead of WaR (Campbell-Johnston et al. 2020; Paraskevas, Kellens, Dewulf & Duflou, 2015).

In an open loop system, the material loses its inherent qualities and characteristics after the initial process (Paraskevas, Kellens, Dewulf & Duflou, 2015). However, some materials do not have the chemical properties to enter a closed loop system and will end up as waste after the first process unless methods for exploiting these waste are made, such as re-entering the by-product into a open loop (Huysman, Debaveye, Schaubroeck, Meester, Ardente, Mathieux & Dewulf, 2015b; Williams, Heidrich & Sallis, 2010). At this stage, the material will be applicable in other uses where not only the efficiency of resource has completely been exhausted, but it can also replace materials that has a negative environmental effect (Huysman et al., 2015b)

Throughout the paper, energy has been used liberally, however at this point after the primary introduction of the abstraction, a further explanation of what is meant with energy needs to be

discussed. There are two main uses of the word energy; conserved energy such as gasoline and electricity, and exergy which quantifies change in a material to be used as accounting for quantity and quality of a resource (Dewulf, Van langenhove, Muys, Bruers, Bakshi, Grubb, Paulus & Sciubba, 2008; Huysman et al. 2015b). Within exergy, the amount of energy extracted from materials is categorized into lost exergy, heat, product, by-product and wastes (Dewulf et al. 2008). This categorization is important for measuring the effect of the final waste category and its destination by looking at the environmental burden, calculated in exergy, of introducing a material into a closed loop, open loop or allowing for an incineration (Huysman et al. 2015b). What Huysman et al. (2015b) concluded was that, while closed loop systems had the greatest exergy benefits, within the open loop systems there was an improvement when cascading was introduced into the process to be able to utilize most of the primary exergy.

2.2.3 Industrial Symbiosis

Industrial symbiosis (IS) is a branch within IE at the inter-firm level (Chertow, 2000). A symbiosis happens when two unrelated parties gain from a specific relationship through an exchange of materials or energy which promotes a sharing of resources (Chertow, 2004; Vladimirova & Miller, 2020). Within the industrial ecology, Chertow (2004) studied how a focus has come to base on optimizing a life cycle of resources from virgin material; to product; to obsolete product; and finally to waste. He also emphasises the cascading effect where one material has additional uses beyond the virgin use, however, in RC, such a material is only re-used when the input is lower than the output. The reasoning behind choosing this system is the absence of waste management costs but also the economic benefit of reselling the product which has been exhausted at the first step but brings another value at the second step (Chertow, 2004).

Vladimirova and Miller (2020) have identified three essential parts to IS: triggers, enablers and barriers. The trigger is a movement that incentivises industrial symbiosis, such as a shift in regulations (Vladimirova & Miller, 2020). One example that they illustrated was the Paris conference COP21 in 2015 that agreed upon lowering carbon emissions which lead to industries having to seek out lower emissions through industrial symbiosis. Chertow (2007) agrees with this view that it is regulatory situations that start out symbiotic processes among firms. The

second example covers recognising the benefits of IS such as increased profitability through reduced waste disposal costs (Vladimirova & Miller, 2020)

A firm can produce a larger profitability through collaboration with another firm than on its own (Fichtner, Tietze-Stöckinger, Frank & Rentz, 2005). The third trigger for industrial symbiosis, according to Vladimirova and Miller (2020) is firms actively seeking deliberate methods for sustainable systems, where social responsibility can be seen as a source of innovation and competitive advantage ultimately leading to cost savings (Porter & Kramer, 2006).

The second essential part is the enabler, here the emphasis is put on understanding the value of materials which are used in operations at all of its life-cycle stages but especially when it is classified as waste (Vladimirova and Miller, 2020). The method of value-creation from waste by disposing of it in an innovative way, which manufacturers gain from, is through by-product synergy (Zhou, Xu & Wang, 2020). If such material would not go through a by-product synergy, the manufacturer would need to bear the costs of proper waste disposal, this method allows for a cost reduction and can even be used for a new market opportunity by transforming waste into a saleable product (Lee, 2012). However, this research does not cover a symbiotic relationship since there are no two independent firms, but one manufacturer and seller from start to finish which as Lee (2012) explains creates a conflict of interest when unnecessary raw resources are used to produce the now profitable by-product from waste.

A firm will dispose of a waste in the most cost effective manner (Chertow, 2000). Chertow (2000) points out that if a company saves money by regular waste disposal over industrial symbiosis it will choose the most economically beneficial path. Similarly he argues that if the cost of waste disposal is only a small part of operational costs, the firm has less probability to engage in a symbiotic relationship. There needs to be a clear advantage as with the case of Lee (2012) before such a shift occurs. However, at this point, Chertow (2000) brings attention to one important aspect: does excessive industrial symbiosis and by-product synergies motivate older, inefficient industries to continue operations over allowing newer innovative sustainable companies to emerge?

Based on Lee's (2012) and Chertow's (2000) contributions, it is reasonable to believe that if a firm has an economical incentive to continue with their non-environmental-friendly, they will do so unless stopped through another way; bringing the last essential point of industrial symbiosis: the barriers (Vladimirova and Miller, 2020). For a firm to be able to create value from their waste, a market for this potential resource needs to be developed as well as appropriate technology to be able to process the materials (Vladimirova and Miller, 2020). Together with a lack of knowledge, even if the ability exists, the realization of symbiosis is hindered by these barriers.

2.2.4 Industrial Symbiosis in Business Models

The topic of industrial symbiosis is not new, clusters of symbiotic communities have emerged globally and can be predicted to become more mainstream in the future (Chertow, 2000). However, new studies that link sustainable business models, such as with CE, and IS have seen a gradual increase (Short, Bocken, Barlow & Chertow, 2014; Baldassarre, Schepers, Bocken, Cuppen, Korevaar & Calabretta, 2019). When including a business model perspective with industrial symbiosis, the focus can turn more towards value creation (Baldassarre et al. 2019).

The value created comes from turning waste into a raw resource for not only a circular business model but also a sustainable model that has a health and environmental benefit. Baldassarre et al. (2019) contributed by showing that finding value in byproducts creates new business streams and ultimately competitive advantage. Similarly Porter and Kramer (2006) show that there does not need to be a trade-off between environmental sustainability and economic sustainability; rather the merging of these two will further propel success. Framework from a circular economy can be used to identify clusters of IS, eco-industrial parks, as well as explain the continuation and control of business practice (Baldassarre et al., 2019). The CE perspective highlights the internal managerial parts in terms of value creation and capture, however, the relevance of an IE perspective can not be underestimated when discussing the relationship between industrial symbiosis and circular economy (Short et al., 2014).

Industrial symbioses that have been formed spontaneously are more efficient for their specific locations and can not be replicated carelessly to create the same symbiotic community elsewhere

(Jacobsen, 2006).There are unique resources and conditions to every IS and even if replicated relationship are formed, they do not have support for being just as efficient since it lacks trust that has to be built with experience (Gibbs & Deutz, 2007) It is rather the act of identifying already existing infant symbiotic industries, and then developing them, that will make for a successful symbiosis (Chertow, 2007).

2.3 Applied Sustainability and Circular Economy Concepts

To actualize sustainable development and the principles discussed within Circular Economy, new business models that incorporate these concepts into their value propositions are needed. In the following chapter we will explore the existing literature on sustainable business model innovation, sustainable and circular business models, and proposed CBM frameworks. .

2.3.1 Business Model Innovation

Business model innovation is increasingly perceived as being imperative for the sustainable shift (Bocken et al., 2014; Schaltegger, Lüdeke-Freund & Hansen, 2012; Pieroni, McAloone & Pigosso, 2019). The business model is proposed as having the potential to support firms in developing and implementing eco-innovations, such as e.g., cleaner production processes and increased energy efficiency (Lüdeke-Freund, 2010; Evans, Gregory, Ryan, Bergendahl & Tan, 2009). Furthermore, as argued by Lüdeke-Freund (2010), business models can in themselves be considered as a form of “organizational eco-innovations” if they incorporate new value creating activities that result in positive social and environmental benefits. Currently, the role of the firm as a purely profit-making entity is under increased scrutiny (Porter & Kramer, 2019), and new types of business models that encompass a wider range of stakeholders in their value proposition could be fundamental to sustain a competitive advantage, as explained by Pieroni et al. (2019). Moreover, the authors argue that companies are forced to decouple their value creating processes from resource consumption to enable a shift toward sustainability and circularity.

2.3.2 Sustainable business models

The core of all business models is to create, deliver and capture value in some way or another (Teece, 2010). What differentiates sustainable business models (SBMs) from traditional business models is evident in the value proposition, where SBMs pursue social, environmental, and economic value creation (Bocken et al., 2014; Stubbs & Cocklin, 2008). This approach, in which a wide variety of stakeholder interests are catered to, is commonly referred to as pursuing a triple bottom line (Bocken et al., 2014). Further, Stubbs and Cocklin (2008) argue that a sustainable organization views "profits as a "means" to achieve sustainable outcomes" (p. 121). This view of the firm has become more commonly accepted in recent years, and represents a stark contrast to the historically endorsed view of Milton Friedman (1970) which argues that the only responsibility of the company is to maximize shareholder value. Concepts such as shared value creation, which emphasizes the importance for corporations to create value for society in concert with economic value creation (Porter & Kramer, 2019), and a renewed focus on cooperative relationships between firms and key stakeholders to address environmental pressures (Bocken et al., 2014) further confirm this broad change in mindset.

The importance of developing a systems perspective is highlighted by several studies on SBMs (Bocken et al., 2014; Stubbs & Cocklin, 2008; Brehmer, Podoynitsyna & Langerak, 2018). As pointed out by Lüdeke-Freund (2010), "whether a business model is sustainable or not will always depend on individual circumstances" (p. 23). To achieve sustainability on a larger scale, and to enable the construction of a sustainable business model, Sommer (2012, cited in Bocken et al., 2014) argues that a broader value-network perspective must be applied. This is due to the holistic nature of sustainability. The large-scale transformations required to achieve sustainable industrial development demands, according to Bocken et al. (2014), fundamental changes in the way businesses operate and create value. As explained by the authors, transforming the core business model necessitates that customers, suppliers, the environment, and other stakeholders are considered to ensure that every step of the process is transformed to tackle unsustainability. In contrast to this proactive approach:

Defensive strategies … are incremental … … adjustments [made] to protect current business models focussing on risk and cost reduction often driven by the need for compliance; accommodative strategies … … are modifications of internal processes and include some consideration of environmental or social objectives (Bocken et al., 2014, p. 44)

Summarily, sustainable business model innovation (SBMI) aims to initiate more radical, holistic changes. However, SBMI has received some criticism for the lack of practical strategies to transform business toward more sustainable practices (Henry, et al., 2020). It is argued, by Henry et al. (2020), that the concept of circular business models are more suitable for achieving sustainability. As proposed by the authors, CBMs are "more narrowly framed and establish specific ways to address the negative consequences of business operations leading to excessive waste generation and resource depletion" (p. 3).

2.3.3 Circular business models

The Ellen MacArthur Foundation is one of the most notable organizations spearheading the development and transition towards a circular economy. One of its many contributions is the ReSOLVE framework, which aims at guiding businesses toward circular strategies (Ellen MacArthur Foundation, 2015). The ReSOLVE framework is made up of six levers, each representing an area within which companies can engage in business actions to develop circular value propositions. As presented in the literature, the six levers are: 'regenerate', 'share', 'optimise', 'loop', 'virtualise' and 'exchange'. 'Regenerate' is about restoring the health and circulation of biological nutrients in ecosystems and shifting to renewable sources of energy and raw material. 'Share' concerns efficiency, maximizing the utility of a product through e.g., long-lasting design, peer-to-peer sharing, re-use, and repair. The goal is, in other words, to decelerate the product loop. 'Optimise' refers to the advancement of waste reduction, as well as increasing the overall performance of the value chain using data analytics. 'Loop' regards the circularity of component and material flows, the goal being to close these loops, focusing on remanufacturing and recycling for finite materials, and on the production of biobased fuels and extraction of biochemicals from organic waste. 'Virtualise' is concerned with dematerializing society by delivering services virtually. Finally, 'exchange' is about replacing technologies,

services, and materials with more efficient, sustainable alternatives. Summarily, the ReSOLVE framework can serve as a guide for managers and entrepreneurs looking to transform or formulate their business model in a sustainable way.

Bocken et al. (2016) propose two fundamental strategies that firms can apply to move from linear to cyclical resource flows: 'slowing resource loops', and 'closing resource loops'. As explained by the authors, the former strategy aims at extending the product lifespan by implementing various design strategies and product-life extension processes. The authors suggest some possible circular design strategies, such as 'designing for attachment and trust', to prolong the user-product relationship, 'design for durability', to increase product endurance, and 'design for reliability', to decrease risk of product failure. Furthermore, already in the design stage, the aim should be to facilitate future product-life extension (Bocken et al., 2016). The authors suggest some possible focal points, such as 'designing for maintenance and repair', to simplify refurbishing, and 'designing for dis- and reassembly', to intensify material and component reuse. Moving on, the latter strategy is concerned with creating circular flows of materials, a view adapted by the authors from the above mentioned concept Cradle to Cradle, introduced by Braungart and McDonough (2002). As previously discussed, this view necessitates the separation of materials into biodegradable and technical components, to enable a perpetual circular flow of resources. Bocken et al. (2016) highlight the importance of recycling the technical components so that the material quality does not degrade in the process. If this is not achieved, the material is rather "downcycled" (Braungart & McDonough, 2002), and as such it merely delays a linear flow of resources, which is not compatible with a circular approach. Furthermore, Bocken et al. (2016) argue that:

> *[D]esign and business model strategies need to be implemented in conjunction. Therefore, the business needs to implement or already have in place, an overall goal or vision focused on "circularity." This will empower innovators in the business to fully capture the business potential of the circular economy within the overarching objective to reduce sustainability pressures* (p. 315)

Six types of CBMs are proposed by the authors, four connected to slowing the resource loop, and two for closing the resource loop. These are presented in order in the table below, adapted from Bocken et al. (2016).

CBM	Value proposition	Value delivery	Value capture	Example of cases
Access and performance	Provide service instead of physical products.	Manufacturer responsible for service and maintenance.	Pricing per unit of service (time, number of uses, performance).	Car-sharing Launderettes
Extending product value	Exploit residual value of products. Deliver affordable refurbished products.	Take-back systems, to ensure consistent product returns.	Lower material cost.	Clothing return initiatives Automotive industry - remanufacturing parts
Classic long-life model / Encourage sufficiency	High-quality long-lasting products. High levels of service.	Durable product design. High customer service levels.	Premium price.	Rolex Patagonia
Extending resource value	Exploit otherwise wasted materials. Lower price.	Collaborations to source materials.	Turning otherwise wasted materials into new forms of value	Interface – collecting and supplying fishing nets as a raw material for carpets
Industrial symbiosis	Collaborative agreements can be established to reduce costs across the business network	Mutual exchange of by-products between firms	Joint cost reductions and value created from former waste streams	Kalundborg Eco-Industrial Park AB sugar and other sugar refiners – internal “waste = value” practices

Much like the framework provided by the Ellen MacArthur Foundation, the authors intend for these various CBMs to aid entrepreneurs, designers, and innovators when constructing their value-networks. Simultaneously, they point to the importance of systems thinking, and the possibility of implementing several of these strategies in conjunction, to steer clear of possible rebound effects. The issue of rebound effects is commonly discussed when energy efficient measures are applied, in that lower costs could result in lower prices, which might actually increase consumption, and as such resource depletion (Bocken et al., 2014). This issue is further highlighted by Pieroni et al. (2019), who argues that a partial implementation of CE principles

might result in negative externalities. The authors insist that research on business model innovation for sustainability must apply a dynamic perspective, as innovation "is a continuous and long journey instead of a single shot initiative" (p. 210).

2.3.4 Circular start-ups

As brought up by Henry et al. (2020), research on the implementation of CE principles has to a large extent focused on incumbents. The authors assert that incumbents commonly apply circular strategies at the margin, rather than at the core of their business models. In their research paper on 128 circular start-ups (CSUs) in Europe, their findings show that CSUs tend to adhere to higher ranked R-strategies than incumbents. The CBM strategies most commonly applied by the studied CSUs were 'regenerate' and 'reduce'. The reduce strategy has previously been expanded upon; regenerate is defined by the authors as a strategy that aims to "[m]aintain and increase the delivery of biological ecosystem services" (p. 9). Common regeneration strategies, as highlighted by the authors, are urban agriculture initiatives and green roofs. Furthermore, the findings show that CSUs, to a high degree, combine socio-institutional innovation with innovations in core technologies. This aligns well with the above mentioned importance of a systems perspective to facilitate radical sustainable advancements.

These socio-institutional innovations are primarily realised by "actively involving customers" (Henry et al., 2020, p. 9), and "working with inter-organizational waste streams" (p. 9). Based on these findings, coupled with the nature of the CSU as a new market entrant, Henry et al. (2020) argue that CSUs are more capable than incumbents to adapt a holistic approach to the implementation of circular strategies. The most disruptive implementation of CBM innovation is referred to as a fully circular company, which implements both downstream and upstream business model innovation (Henry et al., 2020). Downstream innovation refers to changes in the company's "revenue model and customer interfaces" (Henry et al., 2020, p. 3), whilst upstream innovation refers to the "pre-customer face of a product or service" (p. 3).

2.4 Chapter summary

The theoretical background of this paper has now been presented. A historical overview and definition of the Circular Economy was introduced, which explained its theoretical and philosophical underpinnings, and the reason for its emergence as a suggested pathway toward sustainable development. This was followed by a description of various related streams of literature that seek to support the transition from a linear to a circular economic system. Various types of resource management strategies, such as 'waste-as-resource', 'resource cascading', and the common 'R-principles' are shown to be widely discussed in connection to CE. Furthermore, new ways of designing systems and products that conform to a circular economy were presented, such as 'Cradle to Cradle', 'Industrial Symbiosis', and 'Industrial Ecology'. Moreover, the literature on the implementation of these concepts on a fim level was discussed. Two main streams of literature were found in the discussion on business model innovation for increased sustainability, namely research on 'Sustainable Business Models' and 'Circular Business Models'. Our interpretation is that both of these concepts can support the transition to a CE, although we agree with Pieroni et al. (2019) in that a unified research agenda could increase the success and sustainable impact of these various types of frameworks. Lastly, the novel literature on CSUs were presented. This is an exciting emerging field of research that we assume will be further developed in the coming years, and it is our intention to be part of this process with this paper. In the following chapter, the methodology of our research process will be presented.

3 Methodology

In the following chapter the applied methodology of this research paper is presented. A detailed description of the research approach, research design, data collection process and subsequent analysis is provided. Furthermore, the chosen method's limitations and their effects on the validity of the findings are discussed.

The aim of this paper is to present a detailed analysis on the entrepreneurial reasoning behind the implementation of various emerging sustainability concepts in a business setting. We also explore how such an implementation takes form in practice and seek to provide clarity on the limitations and challenges that arise in conjunction with such a business model. Since our inquiry is dependent on a thorough understanding of the whole entrepreneurial process, we chose to conduct a single-case study to enable a deeper analysis of the subject company.

3.1 Research Approach

Due to the relatively recent emergence of concepts such as sustainable business models and the circular economy, as well as the novelty and scarcity of economic actors which apply these concepts as core strategies from the start-up, knowledge about why and how these companies form and operate is lacking. Moreover, despite the prevalence of sustainable development in current political and social discourse, the pace of systemic economic change is slow. This spurred us to carry out research within this field to further the implementation of sustainable development practices. The research strategy of this paper is qualitative, which has several implications for the research process and the analysis. Qualitative research is primarily concerned with providing "thick descriptions" (Geertz, 1973a, cited in Bryman & Bell, 2011, p. 398) of social contexts to generate an understanding of complex social environments. As such, the experiences of participants involved in the researched milieu are emphasized in this kind of research strategy. In the following sections, the interpretative frameworks connected to qualitative research will be further expanded upon.

The view on the relationship between theory and research in this paper is inductive in nature. An inductive approach views theory as emerging from observations and seeks to construct generalizable conclusions from the findings of the research conducted (Bryman & Bell, 2011). As such, when conducting our research, we aspired to allow for the observations to guide us in determining the focus of the paper. We were of course inspired by previous writings and theories within this field of research when conducting our own investigation and acknowledge the impact this had on our understanding of the concepts discussed.

Of great importance within the field of business research is epistemology, i.e., the study of what knowledge is, how one goes about acquiring it, and whether that knowledge is applicable in the specific context (Bryman & Bell, 2011). The applied epistemological position in this paper leans toward an interpretivist approach to knowledge. As explained by Bryman & Bell (2011), interpretivism is primarily concerned with the "empathic understanding of human action rather than with the forces that are deemed to act on it" (p. 16). The essential perspective of this approach is that individuals construct subjective interpretations of the world around them, which demands that the researcher look for a "complexity of views" (Creswell, 2007, p. 92) and "rely as much as possible on the participant's view of the situation" (p. 92). We argue that knowledge of the various circular/sustainability concepts that our paper is concerned with is best understood from the point of view of the individuals involved in the business implementation of these concepts. Since there are several stakeholders that must be taken into consideration when implementing such business practices, and because of the emerging nature of the field, it is our belief that it is the practitioners that interpret, implement, and further innovate upon these concepts.

In relation to the epistemological position of this research paper is the ontological view applied. Bryman & Bell (2011) describe social ontology as being "concerned with the nature of social entities" (p. 20). In this paper a constructionist view is applied. This view maintains that social actors are continuously involved in shaping their social reality, as explained by the authors. There are various extremes of this viewpoint, however our application of the concept is evident in the notion that these social entrepreneurs are co-creators of the meaning of e.g., sustainable practices, Cradle to Cradle-design, and circular economy. This affects our attitude towards the

data collection process, in that we work with open-ended questions and aspire to understand the participant's interpretation of these concepts (Creswell, 2007). One could contrast this with an 'applied method' in which one seeks to investigate whether the social actors have applied the concepts successfully or not. However, due to the novelty and locality of the meaning of sustainability, we hold that these concepts are in constant revision and therefore a constructionist view is the most appropriate for such an inquiry as ours. An example of this is the previously widespread application and notion of end-of-pipe technologies as a legit environmental strategy. Nowadays, focus has shifted toward implementing new solutions in industrial operations from the "bottom-up" so that these polluting agents are removed entirely from the manufacturing process. The same thing is likely to happen with our understanding and implementation of, amongst other things, circular economy and Cradle to Cradle-design.

3.2 Research Design

We apply a single instrumental case study (Creswell, 2007) to explore how entrepreneurs' reason and implement concepts of CE and C2C into their business model. Furthermore, we are concerned about the velocity of systemic change toward a healthy, sustainable society and seek to provide some insight into the challenges present in the transition for companies engaged with these issues in the developing world. Stake (1995, cited in Creswell, 2007) explains that a single instrumental case study is applicable when one has a "research question, a puzzlement, a need for general understanding, and feel that we might get insight into the question by studying a particular case" (p. 260). The company of choice for our case study is Emerging Cooking Solutions, ECS for short, a clean energy company conducting its main activities in Zambia. According to their website, ECS is inspired by Cradle to Cradle-design, Circular Economy and Social Entrepreneurship (ECS, n.d.), making it highly suitable for a case study on the real-world implementation of these theories in the developing world.

An important aspect of case studies is that they are bounded and as such limited within certain specifications (Creswell, 2007). The case of ECS is specific in several ways. Firstly, the company was founded on circular economy concepts and did not, as many other companies, begin with a linear business model that then later transitioned. Secondly, ECS conducts its main

activities in a developing country which entails further implications for the venture. Thirdly, the founders of ECS originate from Sweden which brings an international perspective to the case study. Lastly, due to the time constraints of this paper, our insight into the company and its operations is solely based on information gathered from the webpage of the company and an interview with its founders.

The case study as a research design can be implemented to achieve different purposes. Our main focus is to provide an in-depth description of a specific company and to highlight the particularities of that case, which is referred to as an idiographic approach by Bryman & Bell (2011). As such, this paper is not primarily concerned with constructing theory that holds for every venture within this field, regardless of place and time. However, we do hope that our findings will provide the field with new perspectives and a deepened understanding of the reasoning and challenges connected to circular business models.

3.3 Data Collection Method

The process of data collection began with a discussion about what type of cases could provide valuable and relevant data for the elucidation of our research problem. Two companies were identified as potential candidates and we subsequently reached out to the founders of these companies via email and LinkedIn, asking if they would be interested in participating in a study and providing a short explanation of the overall aim of the paper. One of the companies accepted our invitation and a date was agreed upon for the interview. The themes that were to be discussed during the interview were communicated beforehand to allow for the respondents to prepare in advance. The interview, which lasted approximately two hours, was conducted via video call due to locational differences and as a safety-measure with regards to the covid-19 pandemic. With permission from the interviewees the conversation was recorded to allow for the researchers to relisten and transcribe parts of the interview deemed relevant for the analysis. Creswell (2007) discusses several ethical considerations that should be addressed during the data collection process, such as privacy, consent, and concerns about the dissemination of the finished paper. The participants were informed about the purpose of the study, where it would be made

available, and the finished paper was sent to the participants to allow them to correct possible misinterpretations of the answers given during the interview.

In qualitative research two main interview types are utilized, namely unstructured and semi-structured interviews (Bryman & Bell, 2011). For this research paper, a semi-structured interview technique was deemed most suitable. As explained by Bryman & Bell (2011), the semi-structured approach is usually applied when the researcher has a range of rather specific themes to be investigated, whilst wanting to maintain a high degree of flexibility in the interview process. From the review of previous literature several themes emerged which guided us in the formulation of our research and interview questions. The aim of the interview was to provide an in-depth understanding of the participants interpretation, motivations, and implementation of these emerging sustainability concepts. At the same time, as previously mentioned, our research approach was based on the inductive approach, with interpretivist and constructivist views guiding us in our perspective on the nature of knowledge and social entities. Consequently, great attention was directed towards how the "interviewee frames and understands issues and events" (Bryman & Bell, 2011, p. 467). Alas, the participants were allowed and encouraged to go off on tangents when necessary and follow-up questions were asked when relevant to facilitate a rich and nuanced understanding of the participants view.

3.4 Validity and Reliability

Various criteria of validity and reliability are commonly reflected upon to assess the quality of business research. As explained by Bryman and Bell (2011), the various forms of validity are "concerned with the integrity of the conclusions that are generated from a piece of research" (p. 42). Reliability, on the other hand, is about the potential to replicate the study's findings, which depends on the integrity and consistency of the measures applied in the research process, as explained by the authors. However, due to these concepts' historical connection to quantitative, positivistic research methods, their applicability to qualitative research has been widely debated and questioned. Thus, several new types of criteria have emerged to better fit the evaluation of the quality of qualitative research. As such, this section will be devoted to a critical analysis of our research methodology using what we perceive to be the most appropriate measures.

A relevant criteria for assessing the quality of qualitative research have been brought forth by Guba and Lincoln (1994), namely trustworthiness. As our research is not positivistic in nature, criteria such as replicability of findings are misleading as our intention is not to prove an objective truth using measurements that can later be reapplied to generate the same results, but rather to generate a deeper understanding of the concepts discussed. However, the findings should be considered trustworthy in relation to our applied method to ensure the quality of the research.

Credibility, a sub-part of trustworthiness (Guba & Lincoln, 1994), is achieved if the research is carried out with proper practice, and if the interpretation of the data collected is validated. Our research has been carried out in good faith and is presented with as much transparency as possible to provide the reader with a thorough understanding of the whole research process. Furthermore, as previously mentioned, respondent validation was used to ensure that our interpretation of the answers given by the participants was correct. However, the technique known as triangulation which implies the use of several data sources to ensure the validity of the findings is lacking. Our data collection came from the interview with the founders, and information gathered from the webpage of the subject company. Since our research is primarily concerned with the entrepreneurial viewpoint, this is not a serious fallacy of the paper. However, other data sources such as employees and relevant institutions could perhaps have enriched our insight into the case and its surrounding environment.

Whether the findings of a study are generalizable and applicable beyond the context in which they emerged is a quality criterion generally referred to as external validity (Bryman & Bell, 2011), or transferability as a sub-part of the trustworthiness criteria (Guba & Lincoln, 1994). Qualitative research is usually criticized for its lack of generalizability, as it focuses on providing an in-depth understanding of a specific context (Bryman & Bell, 2011). This research paper is no different, and the reader should be wary of drawing broad conclusions based on our findings without examining the specifics of our case in detail. However, the purpose of this paper is, as already mentioned, not to arrive at an objective conclusion. Rather, by providing an in-depth study of the implementation of a circular business model in Zambia, we intend to provide the

field with a rich description of such a venture, which should result in some insight into the challenges and motivations associated with such a venture in a developing country.

3.5 Data Analysis

The process of data analysis within qualitative research can be divided into three main parts: organizing the data, coding the data into relevant categories, and presenting the data (Creswell, 2007). Due to our limited dataset, which consisted of one interview and information collected from the company website, no sophisticated method of organizing was necessary. As we relistened to the interview, patterns emerged, and the answers were subsequently categorized according to various themes and sub-themes. These were: *Motivations* (economic, social, environmental)*; Implementation* (technology, business-model)*; External influences* (location, institutions, heritage), *Challenges* (financial, technological). When presenting these themes in the analysis relevant quotes are used to enhance the reader's understanding of the participant's view. Furthermore, the themes developed are situated in, and compared to, the concepts and frameworks presented in the literature review.

3.6 Limitations

There are several limitations with the method applied in this research paper. One that has already been briefly discussed is the issue of generalizability. Our findings are based on the information provided by the founders of a single company and as such it is difficult to predict whether the findings can be applied to other companies and entrepreneurs. Moreover, the case study approach is inherently bounded by the specifics of the researched context. Both the internal and external environment of the company, such as socioeconomic factors, geographical location, and the timeframe in which this company has been active potentially affect the findings and could limit the applicability of our conclusions to other settings.

Furthermore, the fact that the studied company applied a circular business model from its inception could result in various conclusions that might not be relevant for companies and entrepreneurs that are restructuring a linear business model.

Another limitation resides in the data collection process. As our only source of information is the founding entrepreneurs, valuable perspectives from e.g., employees, customers, and other relevant social actors that could provide a deeper insight have been overlooked.

3.7 Chapter Summary

Summarily, the applied research method is of a qualitative nature, with an inductive approach to the relationship between theory and research. The applied epistemological position is interpretivist, as we aim to understand the subjective interpretation of the various sustainability concepts from the view of the research subject. This is further underlined by our constructivist ontological stance toward the creation of knowledge. To answer our research questions, we apply an in-depth single-case study on a clean energy company operating in Zambia. Our aim is to highlight the particularities of this case and to further the field in regards to knowledge about the interpretation and implementation of various CE principles in a developing country. Data is collected using a semi-structured interview, and the findings are subsequently sorted from emerging patterns. These findings are later analyzed in light of previous literature on the subject area. The applied method is limited in several ways, however we believe the findings of the study to be valid and reliable. In the following chapter, the key findings of the study will be presented and analyzed.

4 Analysis and Discussion

The company of choice for our case study is Emerging Cooking Solutions, ECS for short, a clean energy company. ECS consists of a parent company in Sweden, and a subsidiary in Zambia which is responsible for its main activities. ECS is inspired by Cradle to Cradle-design, Circular Economy and Social Entrepreneurship (ECS, n.d.), making it highly suitable for a case study on the real-world implementation of these concepts.

On their website, ECS presents their mission as being "to end the use of charcoal for cooking, diminish unnecessary death and disease from air-pollution and stop the deforestation of Africa, starting in Zambia." (ECS, n.d.). Their business model is mainly focused on two product lines, clean cooking stoves and cooking fuel in the form of biomass-waste pellets. The company provides both larger stoves for commercial kitchens, as well as smaller stoves for households. These stoves are fueled by pellets which the company produces from waste sawdust from sustainable plantations. The stoves are rechargeable with built-in solar panels, and the company also provides other types of solar powered home systems such as lamps, radios and mobile chargers.

On their website, the company asserts that their business model impacts six of the sustainable development goals (SDG) introduced by the United Nations (SupaMoto, n.d.). The stoves offered by ECS usually replace cooking with charcoal, which allows the user to avoid both the hazardous smoke produced when cooking with charcoal, as well as the potential threat of abuse when collecting firewood away from home, thus impacting SDG 3 - Good Health and Well-Being. Furthermore, this cooking method enables women and girls to spend more time on e.g., studies, as time is saved on gathering firewood and cooking time, thus impacting SDG 5 - Gender Equality. Moreover, through providing stoves on affordable payment plans, coupled with sustainably sourced pellets and solar products, SDG 7 - Affordable and Clean Energy is impacted. Additionally, SDG 8 - Decent Work and Economic Growth is impacted through the company's creation of 65+ full time jobs and a network of over 200 independent agent-entrepreneurs. Lastly, by reducing the demand for charcoal SDG 13 - Climate Action and

SDG 15 - Life on Land are impacted due to decreased deforestation and consequently decreased carbon dioxide emissions.

We interviewed the company founders for close to two hours. The questions circled around the start-up phase of the company, the motivations and reasoning behind their business model, the application of CE and Cradle to Cradle-design principles in their product offering and throughout the value-chain, and lastly about the challenges experienced. Although the company began its operations almost 10 years ago, we have decided to refer to it as a circular start-up. Undoubtedly, ECS is not in the start-up phase any longer, however due to their implementation of CE principles from the outset, we believe that the term CSU is still an appropriate term. This is especially true since, to a great extent, our focus is directed towards the start-up phase of the company.

4.1 Key Findings

The interview was aimed at developing an understanding for how the company came to be, why and how CE principles were implemented, what the most notable qualities of a CSU concerns, and lastly what the specific setting implies in terms of challenges. In the following chapter, the answers provided by the company are presented in a flowing text. Quotes from the founders are displayed to provide clarity and for the reader to gain further insight into their reasoning. Relevant data is presented within the themes outlined in the methodology.

4.1.1 Motivation

Before the entrepreneurs began building what would eventually become ECS, they came into contact with the, then newly introduced, concept of Cradle to Cradle.

We were very inspired by the mindset of Cradle to Cradle, in that there are ways to produce and consume that are more than sustainable, it can even be net positive.

The interviewees uphold C2C as equal parts design principle and philosophy, and it sparked new ideas about the potential to create products that in their life-cycle contribute positively to the environment, biodiversity, and human prosperity.

Instead of doing less of something inherently bad, or seek to be neutral, the aim is to have a positive impact.

This change in perspective clearly impinged on their creativity and entrepreneurial spirit. Furthermore, it provided them with a path forward.

It gave us the possibility to be creative and free from the permanent bad consciousness that a lot of people with an understanding of global issues carry around with them.

Eventually, this view further materialized when one of the founders came into contact with the carbon cycle.

I remember seeing an illustration of the carbon cycle and thinking about how striking it is that a balanced carbon cycle is the foundation of all life, whilst an unbalanced one creates disruptive environmental effects.

For context, the interviewees explained that during this time there was an increased global awareness of climate change due the burning of fossil fuels and changes in agricultural practices, which has had the effect of releasing carbon into the atmosphere. Coincidentally, the interviewees stumbled upon the concept of biochar, which they explained is a type of coal that is produced when biomass is burned in oxygen-depleted conditions. They regarded it as a promising technique that could capture carbon and reintroduce it into the soil, and it induced discussions about the possibility to create a business model based around this technology. Some attempts were made to cooperate with a local municipality, however it never came to fruition. Simultaneously, through networking activities they learned about new types of pellet fueled stoves which burned in such a way so that the residual product became biochar. When giving a talk on these topics in Stockholm, they were invited by the Swedish Embassy to travel to Lusaka, the capital of Zambia. Here, whilst performing a demonstration of the stove, they came into contact with two locals who were very excited about this technology, as they had been searching for a way to combat the widespread use of charcoal for cooking. Furthermore, they informed the entrepreneurs about the large amounts of sawdust waste that could potentially be used in the production of pellets. This meeting led to a shift in focus.

The transition from our focus on biochar was based on the discovery of how expensive and unhealthy cooking with charcoal really is. This became important in the development of our business model, as we identified the existence of a market opportunity, and it was fundamental when we presented our business rationale to the incubator that would host our project in Sweden.

Their motive for approaching these societal and environmental issues through the business sector was a conscious decision.

We chose the corporate entity over political or societal mediums believing that if you can prove that there is money to be made, change is rapid. From the start, our goal was to show that pellets are profitable.

Their aim was to lead by example in order to create a larger industry movement. This focus on the bigger picture further shows by the rationale behind their balance between economic, social, and environmental value creation.

Our guiding principle has been to balance economic gain and positive impact. Our choices have always been made so that none of these dimensions are diminished.

4.1.2 Implementation

In the following chapter, we will present the interviewees answers relating to the technological solutions applied and the implementation and construction of the business model.

4.1.2.1 Technological Solutions

The use of biomass pellets and pellet-fueled stoves are, according to the interviewees, useful in terms of energy efficiency, environmental impact, health-benefits, and feasibility.

Biomass is useful to create heat and higher efficiency is achieved if the heat is used directly, rather than converting it to electricity. However, it has to be used in combination with proper

technical solutions to achieve high energy efficiency. Just like pellets, charcoal is biomass but in the production process of charcoal, 80-90% of the energy present in the tree is lost. When producing pellets, no energy is lost. Some energy must, however, be added when pressing the biomass into pellets.

According to the interviewees, electricity is commonly regarded as a sustainable source of energy, however due to the underdeveloped electrical infrastructure in Zambia this would necessitate huge investments. Instead, pellet-fueled stoves were deemed a feasible solution, whilst also benefiting the environment and the health of the user.

The charcoal stoves commonly used in Zambia only have an efficiency of around 8%, whilst the efficiency of pellet-fueled stoves is much higher. Switching from charcoal to pellets could potentially reduce emissions by 10 tons of CO2 equivalents per family each year. As such, the cooking sector represents a huge potential to reduce global emissions.

They also reflected on the choice of many of their colleagues in the sector to market efficient charcoal stoves.

It is probably perceived to be an easier solution, and could potentially have been rather lucrative. However, we chose another way as this method does not address the underlying problem, the use of charcoal is still harmful for the environment and health of the users.

In regards to the health of the user, the entrepreneurs explain that pellet stoves burn cleanly with very low emissions, which decreases user exposure to smoke particles and carbon monoxide emitted when cooking with charcoal.

It would have been easier to go to market with significantly simpler stoves, however such stoves would not have impacted the health state of the user base in a significant way.

Presently, the company is about to launch a new stove that has been developed in collaboration with two other Swedish companies.

This new stove is at the forefront of clean cooking technology, and will have the potential to measure use, which allows us to gather data on the amount of carbon reductions achieved. Our

goal is that this will result in new financing possibilities by way of connecting to the carbon market.

When asked about the overall design of the stove, the interviewees underline the long-term perspective, the health impact, and the marketability.

When designing the stoves we think a lot about how we will service it throughout its lifecycle. Since the different components have varying lifespans, we aim to make it simple to replace and repair the individual components. Furthermore, we focus on producing it at a low cost without compromising clean combustion.

When discussing the material composition of the stove and its recyclability, the interviewees highlighted the following.

There is great value in designing products so that they are durable and reparable. Cradle to Cradle talks a lot about bringing materials back into cyclical loops, however recycling requires energy, and so the cheapest and best option is to keep the stoves running for as long as possible.

Furthermore, they point to their prioritization of material flows.

The primary resource flow is the fuel flowing through the stove. There will be tons of material flowing through the stove, whilst the stove itself is made up of a couple of kilograms of material. Our focus is therefore directed toward the fuel component, making sure that it burns cleanly and is sustainably sourced.

4.1.2.2 Business Model

As mentioned, the founders chose to engage in the business sector due to the potential of rapid change.

We had to make a profit that could then be reinvested in order to grow.

When learning that a large part of their potential customers' household budget went to the purchase of charcoal for cooking, they started investigating the marketing possibility of pellets.

Before we even sat foot in Zambia, we investigated the possibility of marketing our proposed solution. We calculated the cost of pellet production and investigated what price the consumer would be willing to pay. Our conclusion was that pellets could be provided at a lower price than charcoal, and that we had a solid business case.

Furthermore, the raw material input in the production of pellets was greatly available.

There were literal mountains of waste sawdust that was just rotting away.

As explained by the interviewees, to date, the availability of material input has not been a constraint for growth. On the other hand, the stove necessary to enable pellet-fueled cooking has presented a substantial problem.

Whilst the pellets are cheap in comparison to charcoal, the stove costs a lot, and as such a great deal of work has been directed toward helping the consumer in this regard.

To circumvent this obstacle, ECS sells the stoves on up to three year payment plans. Moreover, this has become part of their adherence to the principles of C2C.

One of the cornerstones of Cradle to Cradle is the transition toward a service economy. In our case, the idea is that the consumer pays for clean cooking hours. During the installment period, ECS legally owns the stove and if necessary repairs the stove free of charge.

4.1.3 The external environment

Two actors were especially important in the start-up phase of the company to build local networks, as explained by the interviewees.

When starting up, we received much needed support from our Zambian partners and the Swedish Embassy.

Another form of support has been in the form of funding from various development agencies. The interviewees explain that part of the reason for having the parent company in Sweden is to achieve access to this type of funding.

A common condition to acquire funding from development agencies is that there is one company located in the country of operations, and one within close proximity to the agency. This provides the grant organizations with greater security and better control over the auditing process of the use of funding.

Another external aspect highlighted by the founder's was the effect that them originating from Sweden had on the choice of technology.

We would say that our knowledge about pellets and our trust in the pellets industry was an effect of our Swedish background, as there is a long history of the use of pellets and a mature pellets industry in Sweden.

Within the specific context of Zambia, the interviewees point to the lack of a developed recycling infrastructure as affecting part of their operations.

ECS has an e-waste policy for electronic components and batteries, however as of right now all we can do is store them until there are safe disposal systems. For example, in the Netherlands there are recycling companies that cooperate with firms to improve and increase the value of leftover materials, but such systems are not in place in Zambia yet.

Another important aspect of the Zambian context is the common motive behind the production of charcoal.

The act of cutting down trees and producing charcoal is usually a quick method for people to earn money to pay for their children's tuition. Simultaneously, these old-growth forests provide many important services in the local ecosystem, for instance they cool the air which provides much needed rainfall. Furthermore, they host a variety of living organisms such as edible fungi. Deforestation results in increased drought and a decrease in valuable sources of food. It is very problematic that these short-term gains affect the possibility of long-term survival.

4.1.4 Challenges

The founders point to the hardships of acquiring financing as the main challenge.

ECS has required large investments in capital expenditure for the pellets factory.

Another financial challenge is, as explained by the interviewees, due to the fact that they have had to purchase and import stoves from other companies.

The purchase of stoves has been one of the company's largest expenditures. The fact that we sell these stoves on installment plans further delays the recovery of these expenditures.

They further point to the novelty of the industry as an important price factor.

We are still too early. Our business model is part of a larger systemic change on an industrial level, however the technology is still underdeveloped. This is naturally reflected in the price.

Additionally, the specific context has repercussions for the availability of capital investments.

Capital is very expensive in these countries, if available at all. Moreover, although more readily available, outside investments are very expensive as the perceived risk is high and as such interest rates on loans are high. A large part of the company's expenditure goes to paying off interest, which makes it difficult to make a profit.

4.2 Analysis and Discussion of Key Findings

The key finding from the case has now been identified and outlined in 4.2. In the following, we first present the research questions again for clarity and then go through the analysis of each research question separately to discuss findings particularly fundamental to the chosen case and theoretical framework. As explained in the section 3.0 Methodology, the case conducted relies on an interpretivist view derived from the field of epistemology, allowing for emphasis on the case subjects' personal experiences. The discussion will be presented by identifying key systems, from the perspective of the case's interviewees, and their related theoretical framework followed by their individual relevant implications. Although this study was constructed in one setting, the results are beneficial in other settings as well, and should be applied henceforth.

RQ1: *What are the entrepreneurial motives and methods used when implementing circular economy principles in a start-up?*

RQ2: *What are the main characteristics of circular start-ups?*

RQ3: *What are the perceived challenges of implementing such a business strategy in a developing country?*

4.2.1 Analysis and Discussion Research Question 1

The motives and methods behind the implementation of CE principles in a start-up has been shown to be crucial for the understanding of a CSU. This section begins by identifying what the entrepreneurial motives are for the particular case and how this overlaps with the research presented in the theoretical framework. The section ends with a practical example of how such motives and methods are implemented in the real life firm.

Similar to the earliest proponents of a closed view of the planetary system (Boulding, 1966; Pearce & Turner, 1990), the entrepreneurs highlighted the complex of problems related to the linear economy, such as unsustainable levels of resource extraction and pollution. The motive for implementing CE principles in their venture was rooted in a desire to induce a net positive social and environmental impact. This aligns well with the goals highlighted by the literature on sustainable business models, i.e. social, environmental, and economic value creation (Bocken et al., 2014; Stubbs & Cocklin, 2008). Furthermore, the motives of the founders correspond to the way in which Pearce and Turner (1990) have framed the difference between linear and circular systems in the view of nature, in that the firm has taken an embracive role that does not view nature as a means to an end, but rather as an end-goal in and of itself. This is further supported by the importance of C2C as a design-principle and philosophy which guided the entrepreneurs in the search for holistic, net positive innovations.

The motive for approaching these sustainability issues through the corporate entity was two-folded. Firstly, the entrepreneurs wanted to signal that circular strategies can be profitable in order to initiate a wider industry movement. This view is mirrored in several perspectives

provided throughout this paper, where a move toward CE is argued to be economically beneficial (Su et al., 2013; Braungart & McDonough, 2002; Chertow, 2004; Kirchherr et al., 2017). As highlighted by Su et al. (2013), the CE has the potential to be more resource efficient than the current linear system and as such, actors implementing these strategies could gain a competitive advantage. Secondly, in order to grow the company, they viewed it as crucial to make a profit. This overlaps with Stubbs and Cocklins (2008) view of the SBM, in that profit is seen as a means to achieve sustainable outcomes.

The findings further show that the entrepreneurs aimed to promote increased energy efficiency. This was done by adopting efficient stove technologies, and by exploiting sustainably sourced biomass waste in the production of pellets. These methods align with the presented literature on energy and material efficiency (Dewulf et al., 2008; Bais-Moleman et al., 2018; Sirkin & Ten Houten, 1994). The instrument provided by Sirkin and Ten Houten (1994) for measuring resource depletion is applicable in the findings on ECS's material use. As previously explained, Sirkin and Ten Houten (1994) and Kim, Hwang and Lee's (1997) cascading resource evaluation compare the material's usage based on quality, efficiency, and quantity. Since charcoal has a lower quality, lower efficiency and demands more quantity than pellets to produce the same amount of useful heat for cooking, the principles of RC hold that there needs to be a reasonable justification for the usage of such a material. If the environmental impact is lower through an exchange to another material, the unproductive material should be re-linked into an alternative value chain.

Furthermore, the entrepreneurs realized that the use of charcoal is harmful for the environment and detrimental to people's health. They learned from local partners that there was a substantial amount of waste material available that could be used in the production of pellets. When the waste sawdust was brought back into productive use, the energy recovered from the material, based on calculations provided by Dewulf et al. (2008), increased the potential exergy output by minimizing the percentage that would otherwise become waste from in the production from the raw resource; wood. The process from wood - sawdust - pellets - biochar follows an open loop system. This system is most appropriate for wood following Campbell-Johnston et al. (2020) measure for material use appropriateness, as wood is not suitable for a closed loop system

because of its inherent properties. In an open loop system, the wood will have multiple uses and reuses until it ultimately turns into biochar and is introduced into the natural environment again where it can improve the soil quality. At this point, the RC has utilized most of the value found in the material. The same value would not be extracted if the sawdust was turned into charcoal instead of pellets, as it is explained in the findings that the energy loss when producing and using charcoal is substantially larger compared to pellets.

Furthermore, the implication of using pellets instead of charcoal reaches into the dimension of energy conservation. As explained by the entrepreneurs, the production of waste sawdust would occur whether ECS utilized it or not. In other words, the quantity of available sawdust is not dependent on the quantity demanded. However, the same can not be said about charcoal, as it is produced from finite resources. Li et al. (2010) introduce the dimension of energy conservation and a scale of demanded and supplied resources from a future generation's perspective. Linear consumption is characterized as having no regard for future generations. Through the use of waste sawdust from sustainable plantations, the production of pellets does not deplete the natural resources, which aligns with their motive of creating a net-positive impact.

The activities that bring harmony between the industry and the environment is within Erkman's (1997) conceptualization of IE. The start-up ECS had an advantage of beginning as a circular firm instead of conforming to circularity from a linear business model, as they could situate their business model within the local ecosystem. However, circular start-ups do come with their own challenges, as the "balance between economic gain and positive impact" was implemented right from the beginning. The entrepreneur turned away from the potentially "lucrative" charcoal stove industry in favor of more sustainable alternatives. Vermeulen (2006) grouped certain activities that are essential for a sustainable IE; one is especially applicable in the choice of marketing pellet fueled stoves; the adaptation of products that cause no harm. Although there was potential financial gain from marketing charcoal fueled stoves, the utilization of those would go against the entrepreneurs principal motives and would not solve the underlying problem of forest depletion. By choosing more complex stoves, ECS were able to exist in greater harmony with the local environment by reducing the amount of emissions emitted.

Moreover, it is shown that ECS conforms to the common R-principles of CE: ‘recycle’, ‘reduce’, and ‘reuse’. While the entrepreneur discussed the importance of recycling materials, there was some hesitation as to whether or not recycling is the most favorable method. This is in line with several new articles, among them Sakai et al. (2017), who down-prioritize recycling in favor of the other principles. Furthermore, the C2C philosophy views recycling as arguably enhancing cradle-to-grave if the quality of the material is degraded when recycled. However from the perspective of cascading and the closed loop system, recycling is a positive way to make most use of the material. Through closed loop, Huysman et al. (2015b) noted recycled materials had the highest exergy output, and as opposed to wood, the metals in the stove configuration have the right characteristics to enter a closed loop.

The second principle; ‘reduce’ is also implemented within ECS. The stoves are designed with a long lifespan in mind. While Carmen Ruiz et al (2009) point out the disturbing trend of producing products with a shorter lifespan to lower costs, the companies’ production of pellet fueled stoves has a long-term perspective. The stoves are made in such a way that they can be disassembled so that the individual components can be repaired or replaced. This could potentially cause a curbed demand in new stoves as Kirchherr, Reike and Hekkert (2017) implies, however, that is the whole point. The entrepreneurs design a product that will last, and have a long-term objective through introducing service systems to prolong its life cycle. The lowered consumption is a desirable side effect and promotes the circular outlook of the entrepreneurs.

The third principle, ‘reuse’, is also incorporated in the design of the pellet stove, as the components have been designed in such a way to allow for ‘reuse’. The entrepreneurs have calculated the varying component lifespans and have made it simple to replace those once they reach end-of-life. This aligns with the arguments presented by Song, Li and Zeng (2015), in that it prevents waste accumulation from the beginning. This shows how C2C has affected the design stage, and although Braungart and McDonough (2002) believes that the common 3R-principles promotes cradle-to-grave, it could align with C2C if the technological components are recycled so that the quality does not degrade.

Waste accumulation was part of the problem that ECS had identified. The entrepreneurs explained how surrounding wood industries, there were piles of sawdust just laying around with no use. In the perspective of cascading, enough utilization of the resource has not been exploited if it is let to become waste at this point. Therefore the entrepreneurs implemented this notion of WaR and were able to use less virgin materials for their pellet production which is supported by Huysman et al. (2015b) waste destination theory. This concludes the motives and conceptualized methods for circular implementation in a start-up, the following part goes through the practical implementation of such motives and methods.

A symbiosis is a collaboration between two independent entities where both individually gain from the exchange. In the theory of Vladimirova and Miller (2020) as well as Chertow (2004), the wood company selling the sawdust can avoid waste management costs through IS, or on the opposite it can be restricted by classification of the WaR and thus not able to commence the exchange. However, in practice neither of these scenarios were applicable. The entrepreneurs explained how the government was not a strong entity in Zambia and it was neither restricting or helping, which leads back to the entrepreneur's motive background when explaining why such a relationship was formed initially. The start-up was able to clear up a waste problem while creating a value proposition for the health of the people and the environment.

4.2.2 Analysis and Discussion Research Question 2

A circular start-up has shown to be complex; the understanding of motives behind the CE principles explains why this is. At this stage, the question moves away from why and how such principles are implemented, which was explained in section 3.3.1., to where the implantation occurs and thus the characteristics. More specifically, what type of actions and their areas are specific for circular start-ups. The main characteristics: entrepreneurial holistic motives, design process and long term economic, social and environmental value creation, and their applied uses are explained in the following section.

In Lüdeke-Freund's (2010) business model discussion, he pointed out the importance of incorporating value creating activities that result in positive social and environmental benefits. Here, emphasis is on the 'and', as circularity embraces both social and environmental in a

holistic manner. The case study points to the implementation of these values in the early stage of the company. The start-up founders built the business in light of several perceived social environmental issues, such as the disrupted carbon cycle, the loss of old-growth forests and biodiversity from the production of charcoal, and the negative health aspects of charcoal cooking. They then backwards engineered value creating activities that could solve these issues, and just as Henry et al. (2020) argued was the case for CSUs, were able to implement a more disruptive, holistic business model. The findings presented in section 4.2.1. is seemingly very important for the discussion on the main characteristics of a circular start-up, as the founders motives and bottom-up approach can be defined as one of these characteristics. This is especially distinct in that the CSU operates and caters to a wide range of stakeholders through their value-network, as mirrored by Pieroni et al. (2019).

Thus, one of the main characteristics of the CSU is found to be that it is constructed out of the entrepreneurial sustainability motives and chosen methods of circularity. Due to incorporating and building on these values from the infant stage, the CSU is able to include a variety of aspects relating to its stakeholders, both short-term and long-term. The entrepreneurial motives decide which stakeholders are included. Our findings show that a CSU encompasses more stakeholders than a traditional firm. Not only are the stakeholders that are directly affected by the companies decisions thought of, the CSU also includes stakeholders which are indirectly or potentially be affected by the CSU's actions. Potential negative and positive effects in the long-term and short-term are included into the business decisions. This is in line with Stubbs and Cocklin's (2008) argument for sustainable organizations, where profit is not the final goal but rather a means towards it. The CSU entity is very different from Friedman's (1970) concept of the firm, where the aim is to create value purely for the shareholders. From his perspective it would seem to be unthinkable to act in the way a CSU does voluntarily. As shown by the findings, the CSU will abstain from business activities if it poses a risk towards one of its other stakeholders, even if it could potentially benefit its shareholders and profit maximization. The founders of ECS explained that they could have potentially sold more efficient charcoal stoves, which would have been easier in comparison to the efforts required to successfully market pellet fueled stoves. However, from the perspective of our first highlighted characteristic of the CSU, it is not a reasonable strategy. In the long run, the same problem that started this movement would still

exist if the company marketed charcoal stoves, and as such their goals for starting the venture in the first place would not be achieved. Due to the wide range of stakeholders catered to, it takes a lot of effort and time when initiating a CSU, since everything must align on many different levels.

The circular start-up is not limited by previous investments, obligations or organisational knowledge, and as such can implement several CE principles in their core business model. It was found to be freeing by the firm's founders and they were more creative in the search for positive solutions. This is very much associated with the fully circular companies that Henry et al. (2020) discuss, in that the CSU implements circular strategies both upstream and downstream in the business model. However, striving to be fully circular can potentially be very restricting. The study showed that at the start-up stage, the ECS looked into several business opportunities to find the most efficient and appropriate one. They explain how they rejected multiple materials since they did not conform to their values, the concept of C2C, the view of IE that the industry must conform to the sustainable functioning of the ecosystem, as well as the ranking of different CE dimensions. Where 'recycle' was one option, it was not the most suitable one from the 3R perspective. This continued on until the realization that to adhere to a fully circular business model was impossible. This points to another important aspect of the CSU: they are characterized by a lack of capital. As explained by the founders, they focused on lowering the price of the stove so that it could be marketed in the developing context. Thus, they had to deprioritize their focus on the circularity of the components in the stove. However, they argue that this is reasonable in the larger context. The stove is constructed from a couple of kilograms of material, whilst the material that flows through the stove will be in the measure of tons over its lifespan. This is further in contrast with the huge amounts of charcoal that would otherwise be produced in the absence of sustainable alternatives. The production of pellets was therefore prioritized, coupled with providing stoves at the lowest cost possible to enable them to go to market. As such, CSUs can be characterized as having to prioritize the order of processes that are implemented, so that they maximize positive impact whilst keeping the business viable.

The hard attainability of a CBM is the reason why both the circular and the sustainable model are included in this case study. SBM is a tool to be able to understand where the characteristics of a

CSU are derived from and what makes it so different. A SBM can be applied to any firm, however, a CBM is hard to apply to a firm that is not a CSU, based on the first characteristic. This means that a linear firm can become sustainable by changing certain activities to pursue a triple bottom line but it is questionable if a linear firm can ever become circular. The case findings portrayed a scenario of activities that were sustainable but not circular, such as creating a more efficient charcoal stove on partly recycled materials. This is considered to be sustainable by Bocken et al.'s 2014 criteria, however, looking at the ReSOLVE framework by the Ellen MacArthur Foundation (2015), it does not cover all five aspects of circularity: 'regenerate', 'share', 'optimise', 'loop', 'virtualize' and 'exchange'. Therefore compared to the pellet fuelet stove; 'regenerate', nutrients from the energy source, the pellets, are restored into the ecosystem; 'share', the product design, of the stove has, longevity in focus; 'optimise', product net waste is minimal and new stove technology allows for tracking; 'loop', stove is designed for a slowing open loop, whereas the pellets derive from sustainable closed loop system; 'virtualize', is less applicable but the focus lies on selling functional cooking hours as a service which is digitally tracked for performance enhancement; and 'exchange', the pellet stove has a higher efficiency and a circular fuel source than the previous alternative.

Particularly careful design process is the second characteristic of a CSU. As the Ellen MacArthur Foundation's (2015) framework showed the complexity in a CBM, there has been a consistent theme throughout; design. The infant firm is able to design the product activities that conform to circularity through a C2C design and philosophy, this corresponds with Bocken et al.'s strategies on resource flows. The case study showed how every component in the stove is designed for maximal product lifespan, highest resource efficiency together with a positive social and environmental impact. The CSU has an advantage over already established firms in this aspect. The circular start-up is built from the bottom up to address sustainability issues in a holistic design, while the established firm needs to implement changes to already existing practices. While research on an established firm is outside of the scope of the thesis, it is important to make comparisons as the case study start-up contributed newness to their flexible design.

The design process does also entail where the firm has its business activities. The ECS is in a designed IS with an industry that has sawdust as a waste product. Here the design has been

carefully considered to create value at both ends. However, the limitations of design need to be taken into consideration. Jacobsen (2006) highlighted this limitation through differentiating on spontaneous and planned IS, where it is difficult to replicate a successful symbiosis through design. This is overcome in ECS since they went through the route, supported by Chertow (2007), and nurtured their already spontaneous infant symbiosis before it was identified as an official IS. However, this still points to the significance of the design characteristic in a CSU, and how once identified, the relationship was nurtured through a long term sustainable design.

The third characteristic of a CSU is a long term orientation regarding economy, society and environment. The theoretical framework has repeatedly shown how firms move away from Friedman's (1979) one sided economic value creation towards a multidimensional value creation pattern. Su et al. concerned economic, social and environmental benefits in CE, Kirchherr, Reiki and Hekkert (2017) concerned those benefits' effect on current and future generations, Erkman (1997) concerned industry and society as a unit in IE, Vermeulen (2006) concerned how these units of IE should be applied into society, Lüdeke-Freund (2010) concerned the connection between business models and value creating activities towards social and environmental benefits, and Porter and Kramer (2019) concerned the link between corporate economic value and societal value. The list goes on, however, a common consensus on the importance of a multidimensional view in value creation can be reached. This is the basis for the construction of the case company in its infant stage, throughout their lifetime; a regard to all dimensions which will be exemplified systematically below.

To be able to continue to do good, the CSU needs to have a profit. In the key findings, the emphasis was put on ECS being a company with both positive impact and profitability in mind. According to the company, this balance was important as a too large focus on profitability was not considered an option, but a disregard of it was also not considered sustainable. It was explained that being a non-profit was too dependent on grants and contributions. By being a profitable company in Zambia, they could on a macroeconomic level create job opportunities to be a part of the local prosperity. Correspondingly, by showing profitability in the industry, ECS had hopes to attract the financial sector to be able to advance within the industry through opening up for discussion by being socially embedded. This type of long term thinking is unique for

CSU's, the company founders explained how their goal was to be outcompeted by another local pellet fueled firm. That would then be a sign that the industry has developed a new more efficient producer that can use less resources and further the positive impacts on nature. After all, the founders expressed a belief that the biomass would accumulate many job opportunities, again bringing in the perspective of multiple dimensions of value creativity not directly tied to the company in question but with the philosophy behind.

The dimension of society has its evidence in the practical dealings of ECS. Because of the advanced technique available, there was a choice in making a cheap and affordable stove, or a more expensive but healthier version. To just make another cheap stove, would not improve the problem but there was no use in creating a stove that no Zambian would be able to afford. Therefore ECS implemented a system for paying in installments, so that everyone could have access to this new technology. It was also not a one time contact with ECS as a seller but also as a service provider. ECS is responsible for the service and repair of the product. What they sell is not a stove, but performance and cooking hours. The inhalation of the smoke was a widespread problem. The availability and affordability of this new pellet oven, allowed families to save tons of carbon dioxide per family. This change is, once again exploring a dimension above the regular; holistic social wellness.

The dimension of the environment has two sub dimensions; material utilization and the release back into the ecosystem. The two main cyclical systems that Braungart and McDonough (2002) raise are; not biodegradable and must be kept in a separate system; biodegradable and can safely unite with the ecosystem. The first; the stove, is covered by the C2C design process and is kept in a separate sustainable system. The second; the pellet, is also covered by the C2C design and is reintroduced in a safe way to the environment in the form of biochar. The material utilization regards the exorgy and cascading of the resource. ECS had a conscious design behind the ovens, even if they were more expensive. The pellet stove uses a technique that allows for less raw materials to be used and lost in the production. ECS means that pelles is the right source for heating as too much exergy is lost when charcoal is used instead, and that the effectiveness of the source is very important as pellets can reach a temperature that charcoal can not. Therefore it is most appropriate out of the standpoint of resource utilization to replace charcoal consumption

with pellet consumption. As ECS explained, the raw materials were carefully selected to make sense on all levels; another trait inherently in CSU.

The sub dimension: the release back into the ecosystem concerns the waste aspect. As a CSU, the adherence to a zero waste policy is high. ECS acknowledges the benefits of carbon in the right form, when carbon is at the right place; life thrives. When carbon is in the wrong place; it is a burden. In the design of their product, the nutritional value was taken into consideration. When carbon is released as carbon dioxide, it has a low nutritional value for the environment. Therefore, the design is made to release less carbon in the air and keep it as biochar which can then be safely released into the soil to join the natural carbon cycle. Thus, returning to the concept of C2C, where the pellets have become cradle again as opposed to grave.

4.2.3 Analysis and Discussion Research Question 3

The findings show that the most critical challenge has been to finance the venture. Up until now, literature on the implementation of CE principles in start-ups has been lacking, especially in the context of developing countries. As such, complications in regards to financing have largely been overlooked. Previous research has primarily discussed the possibility of achieving economic benefits through increased resource and energy efficiency (Lüdeke-Freund, 2010; Evans et al., 2009, Su et al., 2013), value-creation from waste (Vladimirova & Miller, 2020; Lee, 2012; Chertow, 2004; Erkman, 1997), increased ability to sustain and build a competitive advantage (Pieroni et al., 2019; Porter & Kramer, 2019), and the use of new types of value-capturing activities (Bocken et al., 2016, Henry et al., 2020). Although the implementation of CE principles can result in various economic benefits for the individual firm and the greater social context, our findings show that the construction of a CBM in a developing market necessitates new sustainable technologies and processes, which require heavy investments.

Firstly, the customers in this socio-economic context do not have the resources necessary to invest in new, sustainable products. The choice of ECS to market pellet-fueled stoves has necessitated large capital expenditures in pellet production facilities and large capital requirements for the purchase and development of novel technological stove solutions. Despite the high-quality of the stove marketed by ECS, which provides environmental and health-related

benefits to the consumer, a premium pricing strategy cannot be implemented and as such the cost of these investments cannot be transferred to the customer. This finding contrasts the ideas put forth by Bocken et al. (2016), since a premium pricing strategy is not viable despite providing a high-quality product. Furthermore, to enable the user access, ECS sell their stoves on long installment plans, and as such capital is bound for long periods of time. This further strains the economic viability of the business. Summarily, the conclusion is that the socioeconomic context puts certain constraints on the pricing strategy of circular companies. As such, the CSU must, at least in the short-term, bear the cost of providing these sustainable solutions.

Secondly, our findings show that the availability of capital investments are poor in the developing context. Capital is expensive or non-existent within the country, and outside investors perceive it as a high-risk context which results in high interest rates. There is a general lack in the literature on CBMs that address the financing aspect of implementing circular, sustainable solutions. Our interpretation of this is that it is partly due to the lack of research subjects and as such research in general is lacking on the implementation of these practices in poorer countries. Most research has focused on transitioning incumbents, as these are perceived to be instrumental in the transition toward a CE due to their size and potential impact. As highlighted by previous research, the transition to CE implies a systemic change, which demands changes on several levels of society (Kirchherr et al., 2017). The lack of financial structures that support the implementation of sustainable solutions in the developing context could potentially be one of the reasons for the lack of capital. This aligns well with the perspective of Pearce and Turner (1990), who argue that the economic system is not adjusted to sustainably co-exist with the natural systems. If the entrepreneurs are correct in their assessment that these innovations could potentially decrease the amount of CO2 emissions by 10 tons per year and family, such investments seem economically sound on the basis of global sustainable development. The literature on CBMs aim to enable businesses to capture the social and environmental value created by implementing circular principles (Bocken et al., 2016; Ellen MacArthur Foundation, 2015; Henry et al., 2020). However, the findings seemingly show that functions which enable individual businesses to capture economic value from these results are not fully developed.

4.3 Chapter Summary

This chapter began with an informational overview of the studied company. We subsequently presented the key findings in section 4.1. The findings were then analysed and contrasted with the presented theoretical background. The summary of the findings conclude that the entrepreneur follows motives with origin in a holistic approach, and will implement those that have the greatest value for the economy, society and environment, while finding challenges in the financial aspects. In the following chapter, conclusions based on the analysis are presented.

5. Conclusion

In the following chapter, we present our conclusions in regards to the research questions. We discuss the theoretical implications of our findings, and provide recommendations for future research.

5.1 Addressing Research Problem, Aim and Questions

This study set out to investigate circular start-ups, which in our view had not received sufficient attention in the literature at the point of writing. Research on transitioning linear companies have dominated the research field, and as such this study aimed to illuminate the overlooked perspectives by questioning why, how and where circular principles are implemented in the business activities. We also wanted to understand what challenges CSUs face, especially in a developing context. This research is not sufficient on its own, it is rather aimed at initiating the process of research into these areas.

5.1.1 Addressing Research Question 1

The motive for implementing CE principles in their venture was rooted in a desire to induce net positive social and environmental impact to challenge the unsustainable linear economy. The firm took an embracive role where a big emphasis was put on positive impact. This approach was two-folded: to signal that circular strategies can be profitable, thus initiating a wider industry movement, and to achieve continuous sustainable outcomes by making a profit that could be reinvested into the firm. A further aim of the entrepreneurs was to promote an increased energy efficiency, having a holistic view, which justifies the appropriateness in the usage of materials. This was achieved by RC and taking calculative exergy considerations, to be able to use the full potential of a resource. The future generation's perspective engrained this energy conservation motive. The goal was to bring harmony between the industry and the environment. The financial incentive of lucrative ventures was discarded if it went against the entrepreneurs principal motives. Explained by the motive that it would not solve the underlying problem.

The entrepreneurs recognized popular CE principles such as ‘recycle’, ‘reduce’ and ‘reuse’ as a method to implement circularity. But they were also aware of challenges stemming from combining a C2C perspective with the CE perspective and prioritized accordingly. The principles of ‘reduce’ and ‘reuse’ took precedence over ‘recycle’, however, ‘recycle’ was still recognized for its positive aspects when no other option was available.

The ability for the product to be easily repairable was one way to prevent waste accumulation. The other way used was through finding material sources that derived from accumulated industrial waste. Dormant material that would otherwise not reach its full exergy potential. The company was then able to use less virgin materials in their pellet production, and at the same time create a value proposition that benefitted the health and economy of the customers, as well as the local environment.

5.1.2 Addressing Research Question 2

The first characteristic of CSUs is the entrepreneurial holistic motives. A CSU aims at achieving positive social and environmental impact in a holistic manner. Implementation of those values in the early stages can result in a more disruptive business model. The entrepreneurs implemented a bottom-up approach to include a wide range of stakeholders in their value-network.

The second characteristic of CSUs is that they will take a wide range of stakeholders, that are directly or indirectly affected by its actions, into account when making a decision. If an activity poses a likely risk towards one of its stakeholders, the CSU will abstain from such activities even if it could provide some financial benefits. This large range of stakeholders could be seen as a limitation for the CSU.

The third characteristic of the CSU is a careful design process of the product and the business model. The infant firm is able to design product activities that are in compliance with the inherent values of the company. The products of such companies have a long lifespan, high resource efficiency and overall induces positive social and environmental impacts. The CSU will also design a business model which creates values at all ends whilst having long term

sustainability. It usually enters into symbiotic relationships, such as described in the literature on IS, to promote holistic benefits.

The fourth characteristic of a CSU is that it promotes long term economic, social and environmental value creation. This multidimensionality is constructed during the company's start-up stage and kept throughout the whole lifetime of the CSU. Such dimensions include the economic dimension; being socially embedded to create a discussion on profitability within an industry. That is a way to attract the financial sector on a macroeconomic level which will create a larger efficiency and job opportunities within the industry. The social dimension; product availability for improved social wellness. Environmental dimension; better resource utilization and a safe release back into the environment through selecting resources that make sense on all levels and are able to return to the natural cycle.

5.1.3 Addressing Research Question 3

The most critical challenge for a CSU is to finance the venture. The construction of a CBM in the developing context demands heavy investments in sustainable technologies and processes. Moreover, premium pricing for products is not an option in this context. CSUs have to engage in customer finance to enable the adoption of technological innovations. Furthermore, product development must be conducted as the necessary technologies do not exist “off the shelf”.

5.2 Theoretical and Practical Implications

Despite the limitations of the applied method, we propose some theoretical implications from our findings.

Our findings on the methods implemented, the characteristics of CSUs, and the challenges point to the importance of applying a holistic approach. Literature on circular economy and the connected concepts, as well as the literature on business model innovation also highlight this fact. However, the field is rather fragmented into various types of circular initiatives. The importance of sustaining a holistic approach echoes from the first writers on the circular economy Pearce and Turner (1990), in that all components of the economic system and natural

systems are interrelated. As the research field is progressing, it is natural that several streams of research emerge. This is necessary, as the issues are complex. However, we would like to underline the importance of not forgetting the bigger picture, in that all of these theories interplay as components of a larger systemic change. The circular economy points as a concept to a circular system where total resource use does not exceed the carrying capacity of the earth. The current field of research is a giant leap forward to build strategies for sustainable development, and as knowledge on the functioning of natural processes in relation to economic realities is furthered, the theories must evolve accordingly.

The methods used in the implementation of circular principles in a developing context provide the theoretical field with much needed knowledge on the transition toward CE in poorer countries. CBM strategies such as premium pricing are shown to be impossible to implement, due to the socio-economic context, despite providing an important high-quality product.

Another finding is that CSUs in developing countries are financially limited. Therefore they prioritize material flows to maximize positive impact and simultaneously keep the business running. We further add to the theory on product-service replacement, in that these business model innovations are not only used to enable the company to further profit on the repeated use of their product, but that it is also implemented through installment plans to enable the customer to use the technological innovation in the first place.

A practical implication of our findings on the motives of the entrepreneurs is that it can act as a guide for other actors interested in promoting sustainable development. To implement a fully circular, sustainable business model, it seems beneficial to start off with a thorough understanding of the perceived issue. The entrepreneur can then mold the business model so that it encompasses all relevant stakeholders to maximize the positive impact. Moreover, the financial challenges have practical implications for the work of policy makers, politicians, banks, and development agencies. New financing methods must be developed to promote the advancement of sustainable initiatives in developing countries.

5.3 Research Limitations and Future Research

As discussed in the methodology section, the research method applied in this paper has several limitations. Our generalizations on the nature of a circular start-up are developed from the findings of a single-case study and as such should be considered as preliminary research. The case is inherently bounded by the Zambian context and the specific motives and as such methods implemented by the studied entrepreneurs. We suggest that future research develops upon the concepts suggested to provide a clearer understanding on the nature of CSUs.

Furthermore, the motives for implementing circular principles likely varys depending on the context, and as Lüdeke-Freund (2010) proposed, sustainability is also always dependent on the specific context. Therefore, to further the understanding of why these business models are implemented, entrepreneurs in other developing countries and other contexts should be researched.

Additionally, our paper is limited in the perspectives portrayed. No quantitative economic analysis of the company was implemented, neither did we compile any data on the perspectives of other relevant stakeholders. As the transition toward a circular economy is a holistic process, due to the interlinkage between various components in the economy, research to further the transition should aim to provide a similarly holistic view. As such, we suggest for future research to investigate the consumer's perspective on these sustainable innovations in the developing context. Further, future research should aim to understand the effect of institutions on the development of these business models.

Research on how to further improve the possibility to capitalize on the provision of environmental and social value is needed. As shown by our findings, it is difficult to monetize these benefits. The entrepreneurs view carbon credits as the most mature mechanism that could potentially address this gap. We propose that future research further investigates novel financing instruments.

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