The evolution of the Cradle to Cradle model implementation within organizations

Master Thesis

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Executive summary

The following study represents the final Master Thesis exam for acquiring the MSc. Degree in International Business and Politics at Copenhagen Business School.

Built upon a multiple case study analysis of three companies, this thesis investigates how the cradle to cradle (C2C) business model is dynamically implemented in routinized company activities. Each case company was analyzed in terms of the approach it took in integrating the cradle to cradle environmental paradigm into its operation. Findings suggest that several organizational routines are involved in applying the cradle to cradle principles. These routines have been grouped in cradle to cradle routine bundles. Throughout the C2C implementation process, evaluation, operationalization, communication, training and re-certification routines were included in the bundle of routines organizations use in adapting to the new model. By analyzing the findings through an evolutionary theory perspective, the bundle undergoes an evolutionary process of variation, selection, replication and retention. This research found that these evolutionary steps are intrinsically linked to the routines employed at that moment. The characteristics exhibited by these routines are also a contributing factor to the development of the evolutionary steps leading to the advancement of the whole C2C routine bundle. Research also found that routines dealing with re-certification by constant monitoring of own activities in accord with C2C principles as well as company external pressures lead to a greater retention of the newly developed routine bundle.

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I.   Introduction

The Cradle to Cradle business model provides companies with an innovative view of their environmental approach to production and whole economic activity. Based on three principles: waste equals food, use of current solar income and the celebration of diversity, the rather new business concept promotes a shift from the present linear production process to an integrated, closed loop cycle of materials. With its focus on determining economic actors to act in terms of being good instead of less bad, the C2C concept is gaining more and more attention from local authorities, companies and environmental NGOs.

The C2C concept developed and broadened by Michael Braungart and William McDonough has been so far described in terms of outcome and proposed steps in achieving positive impacts. However, with the increased involvement of corporations and local and national authorities in adhering to the C2C principles, a more detailed understanding of the organizational implications is needed. A closer inspection of how companies deal internally with the implementation of the new model will provide insight into how its evolution influences the concept itself as well as the organizational routinized activities.

Three case companies have been selected to be part of the study on how the C2C model and principles are applied in internal organizational structures and what leads to their retention. The evolutionary theory provided the lens through which the analysis would be carried out. This approach allowed for a detailed look at the internal mechanisms and routines of the case companies. Research suggests that companies employ routines along the implementation process. These routines are gathered into a C2C routine bundle which in time undergoes a series of evolutionary steps. No study has been found to describe and analyze the dynamic evolution of the C2C concept once companies have chosen to follow the model. Therefore, this thesis seeks to investigate what course of action companies employ and how they deal with the new requirements set on their routinized activities. This goal leads to the following Research Question:

Q1: What are the organizational routines used in the Cradle to Cradle implementation?

Through the multiple case study approach this thesis three selected companies that have implemented the C2C principles in their operation. The research found five organizational routines employed by each company which have been grouped in a C2C routine bundle:

- Evaluation routine
- Operationalization routine
- Training routine
- Communication routine
- Re-certification routine

These routines are the result of the iterative process of data analysis from all case companies. The routine categories became apparent once each case was analyzed and compared with the remaining two. These iterations among cases as well as reviewed literature resulted in the presented routines which became the major lens for viewing the cases further.

The findings suggest that this routine bundle goes through a series of changes from the moment first contact is made with C2C until the moment when implementation results are seen. This leads to the second Research Question:

Q2: How does the routine bundle evolve in the organizational setting?

Data indicated that the C2C routine bundle is subject to an evolutionary process which influences the actions and transformations that the company performs in relation to C2C implementation. Taking the model put forward by evolutionary theorists, the bundle is analyzed through the four evolutionary stages: variation, selection, replication and retention. This research shows that one or more routines and their characteristics influence each of the evolutionary steps that the whole bundle undergoes.

The final stage of the evolutionary model marks the retention of the new process and routines in company activity. This leads to the third Research Question:

Q3: Under what conditions are the routines retained?

Increased retention of the C2C bundle was seen as being dependent on the development of the re-certification routine. Firms investing in the re-certification processes were discovered to have embedded the C2C practices within their activity to a higher degree. Through their ability to generate new variation, re-certification routines have also been found to mitigate a retention disadvantage: that

of inertia in routines. External factors were also seen to be influencing organizational retention of the C2C routine bundle.

Through the research presented, the contributions of this thesis are twofold: firstly, it elaborates on evolutionary studies on organizational routines by including routine bundles and their development through the entire evolutionary process. The propositions presented towards the end of the study give more details on each evolutionary step. Secondly, research has provided a dynamic view of the C2C model once it reached the internal processes of the firm, contributing in this way to the present literature on C2C.

1.1 Delimitations

This thesis is delimited to the conceptual framework taken into consideration in the process of data analysis. The framework presents certain aspects of both C2C and evolutionary theory which have served as incentive for the presented research. Delimitations apply in terms of the choices made regarding theoretical approach and research context. Limitations have been acknowledged and the findings are delimited by the collected data.

1.2 Thesis structure

The illustration below presents an overview of the main sections which this thesis comprises of:

1. • Introduction

2. • Conceptual Framework

3. • Methodology

4. • Data Description

5. • Analysis

6. • Conclusion & Further Perspectives
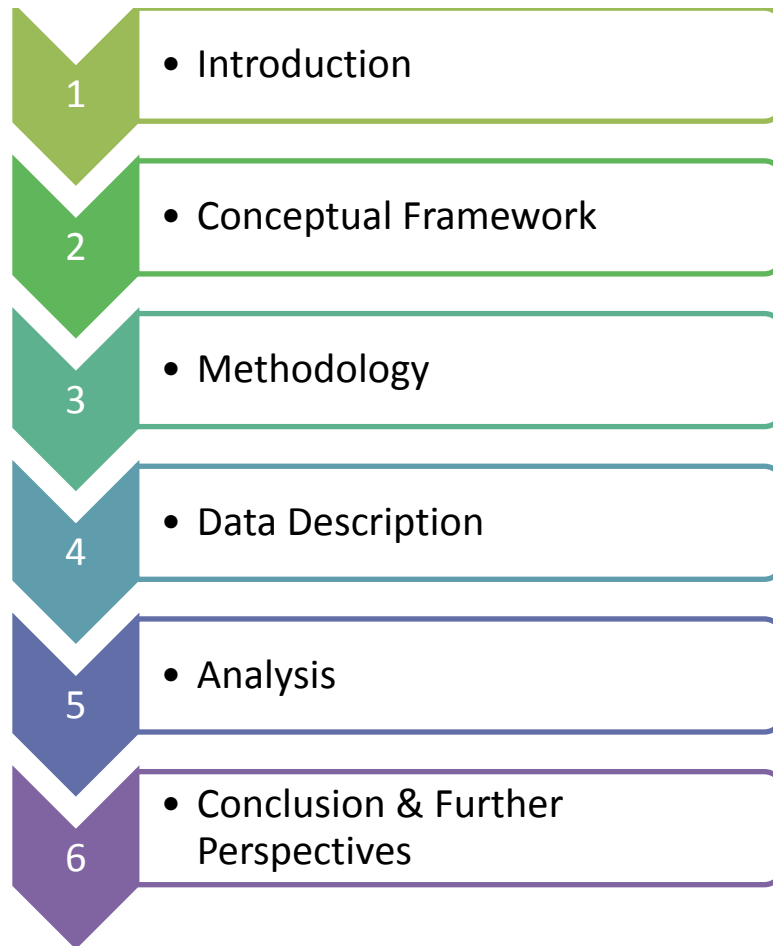
The process of C2C implementation in companies presents an interesting opportunity of studying the evolution of the bundle of routines and of factors leading to its retention. Looking at three case companies, this research seeks to provide answers to three Research Questions regarding the type of routines involved and their collective evolution. The conceptual framework used throughout the thesis is presented in the next chapter.

II.   Conceptual framework

This chapter provides a more detailed description of the concepts and models used in analyzing the data in the three case studies. Firstly, due to the recent nature of its development, a characterization of the Cradle to Cradle concept is needed to avoid ambiguity. The information is necessary for a better understanding of the relationship between the nature of the C2C implementation process and the routines employed by the case companies.

Secondly, a brief overview of the evolutionary theory is offered. The evolutionary theory was chosen as the view point in data examination. The concepts of routines and routine bundle are defined and explained as they have been taken as the unit of analysis. A definition of the routine bundle term is required in order to proceed to the case analysis. The variation-selection-replication-retention evolutionary model is presented and its steps explained.

Finally, the chapter gives a short overview of the link between the Cradle to Cradle concept and the evolutionary approach, thus presenting the research focus.

2.1 Conceptualizing Cradle to Cradle

2.1.1 The shift to eco-effectiveness

In recent years, literature on sustainability and companies' environmental strategies has seen quite a rapid development. Studies like Senge's "Necessary Revolution" and Esti and Winston's "Green to Gold" have given new insight into how environmental and sustainable production can be achieved in a difficult and strained economic background (Esti, Winston 2009, Senge 2010). Esty and Winston (Esti, Winston 2009) have called this trend the "Green Wave" sweeping the business world as they present their view on making environmental thinking part of the strategy.

What is or is not considered sustainable business practice from an environmental point of view has been largely discussed both in international fora such as the World Business Council for Sustainable Development (WBCSD) and in corporate sustainability literature. In their review on the applicability of the sustainable development concept to the business level, Hockerts and Dyllick (2002) point out that very often, the used criterion for corporate sustainability is represented by a firm's efficient use of natural capital (Dyllick, Hockerts 2002). This eco-efficiency seems to be the concept most companies have come

to terms with in their attempt to summarize the business take on sustainable development (Dyllick, Hockerts 2002, Young, Tilley 2006, Schaltegger, Burritt 2005).

Schaltegger (2005) defines eco-efficiency as "the ratio of value added to environmental impact added per unit, where environmental impact added is equivalent to the sum of all environmental impact generated directly or indirectly by a product or activity" (Schaltegger, Burritt 2005). Under the umbrella of eco-efficiency, indicators such as energy, water and resource efficiency, waste or pollution intensity were considered (Dyllick, Hockerts 2002). Eco-efficiency seemed to be a win-win scenario that companies could apply in dealing with environmental challenges and provided the business link to sustainable development. This inherent win-win assumption has made eco-efficiency to be largely adopted by businesses.

However, the promised impacts of this tool have been questioned in recent literature, its results falling behind what is considered to be an environmentally sound strategy. Being a relative measure of performance, eco-efficiency alone could lead to rebound effects of resource productivity improvement and natural systems declining (Dyllick, Hockerts 2002, Barbiroli 2006).

Authors like Schaltegger and Burritt (2005) consider important the integration of eco-efficiency tools with aggregate indicators of eco-effectiveness. Eco-effectiveness refers here to "the business challenge of making substantial reductions in the absolute scale of the environmental impacts of their products, processes and investments" (Schaltegger, Burritt 2005). In this view, eco-efficiency and eco-effectiveness seem to be complementary to one another.

In contrast to this position, Braungart and McDonough (1998) regard eco-effectiveness in stark opposition with eco-efficiency, putting more focus on the differences between the two approaches. Serious flaws mark the eco-efficiency discourse, some referring to the linear, one-way strategy for manufacturing systems generating waste that can only be downcycled or discarded into a landfill. In this vision, reducing environmental impacts by eco-efficient ways "creates the illusion of short-term relative improvements" (Young, Tilley 2006) and leads to business centered solutions instead of environment centered strategies.

Eco-effectiveness presented by Braungart and McDonough, comes in to address these problems and introduces an alternative way of designing and making business built upon the notion of "waste equals food". The eco-efficient environmental strategy embraces the zero-waste and linear flow of materials, the so called cradle to grave paradigm. In contrast to this, the eco-effective strategy "celebrates the abundance and fecundity of natural systems, and structures itself around goals that target 100 percent sustaining solutions" (MBDC, 2001). As no progress can be made without generating waste or using some kind of

energy(Braungart, McDonough et al. 2007), eco-effectiveness requires industry to reinvent its practices so that the results are regenerative, not depletive, processes (Young, Tilley 2006, Barbiroli 2006, Braungart, McDonough et al. 2007, Barbiroli 2007, Braungart, McDonough 2009). Therefore, eco-effectiveness represents a shift from the former paradigm of eco-efficiency.

As tools for the eco-effectiveness approach, Braungart et al. (2007) have developed the cradle to cradle (C2C) design, eco-effective nutrient management system and the intelligent materials pooling structure, which deal directly with maintaining or upgrading the quality and productivity of material resources.

2.1.2 Introducing C2C

Braungart and McDonough have developed the C2C concept in an effort to introduce its application in various industries as a business model (Braungart, McDonough et al. 2007, Daughton 2003, Kumar, Putnam 2008, Stouthuysen, le Roy).

There are three principles that C2C stands for and through which the implementation of the concept can be achieved in organizations wanting to realize the transition from eco-efficiency to eco-effectiveness[1].

The **"Waste equals food" principle** is based on the nutrient cycle in nature. It leads to the elimination of the concept of waste as any unnecessary component of one system becomes nutrient for another system. This material flow system is a fundamental component of the C2C method of production. According to its composition, a product can reenter a biological cycle or a technical cycle at the end of its life. *Appendix C* illustrates the two cycles in more detail.

The **use of current solar income** promotes the elimination of the use of fossil fuels in production and the incorporation of the renewable and clean energy technologies.

The **"celebration of diversity"** principle is intended for firms focusing on the multitude of solutions and criteria that eliminates the instability and imbalance provided by a narrow view of production.

C2C is intended as a roadmap towards an ideal goal of changing industries and building supporting networks and cooperation between suppliers, producers, customers and enabling the necessary innovations for this purpose. In order to work towards this goal, industry has to follow a series of steps which include: having a correct view of their current situation ("know where you are"), defining goals towards C2C, setting milestones, communicating on progress, and cooperating with customers and other industry partners.

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[1] For more information please consult EPEA website at www.epea.com

A Cradle to Cradle certification is awarded to companies that take on the challenge of shifting from their traditional eco-efficient organization of production to the eco-effective promoted strategy based on the principles and steps of C2C. While consultancy and aid in implementing the steps towards certification can be given by a great number of agencies and organizations, the certification stamp and recognition remain with the Environmental Protection Encouragement Agency (EPEA) and McDonough Braungart Design Chemistry (MBDC) organizations. A deeper analysis of the certification criteria and levels is given in *Appendices D and E*.

From an organizational perspective, the Cradle to Cradle concept represents a goal-driven approach to addressing environmental issues. This approach guides behavior to specified ends, while also shaping the development of tools that will help evaluate the progress along the way (Rossi, Charon et al. 2006). In attaining a C2C certification, multiple departments within the organization as well as organizations outside the company are expected to exchange knowledge and share information. This task can prove quite challenging to organizations engaged in the process as they will need to regularly assess and monitor information both from their own activities and from suppliers, research institutes and certification bodies.

Critics of the C2C approach have pointed at the increased confusion in attaining a C2C product or becoming a C2C organization which is caused by the lack of well-defined strategies that are usable in a design process (van der Grintern 2008).

To date, there has been little research done on C2C development in businesses that have opted for this concept that aims to address this criticism. Other than the works of Braungart and McDonough and authors referencing and expanding their work (Daughton 2003, Kumar, Putnam 2008, van der Grintern 2008, Scott 2009), the literature body lacks the view of this new approach in a dynamic business setting. Much of the present research presents a descriptive, static image of the concept, making it difficult for businesses to relate to. In order to address this gap in the C2C literature, this study proposes a deeper look into how organizations have successfully implemented the C2C concept within their production processes. By looking at the C2C implementation through an evolutionary perspective, this research will present C2C in a dynamic setting, thus contributing to the further development of the concept.

2.2 An evolutionary approach to organizational routines and routine bundles

2.2.1 The evolutionary theory of organization

In recent years, evolutionary theory has gained increasing attention from authors in various fields, from economics to corporate strategy and behavior, organizational learning and change, and knowledge management. Starting from the seminal work of Nelson and Winter (1982), a wide array of scholars has

employed evolutionary thinking in dealing with organizational concepts, thus contributing to the terms' applicability in social science (Cohen, Bacdayan 1994, Tripsas, Gavetti 2000, Murmann, Aldrich et al. 2003, Feldman, Pentland 2003, Feldman 2003). The firm and its behavior and development capabilities stand at the centre of attention in evolutionary theory. This is evidenced in the opening sentence of Nelson and Winter's book: "In this volume we develop an evolutionary theory of the capabilities and behavior of firms operations in a market environment"(Nelson, Winter 1982) p. 3, as well as in many of their and other author's following works (Murmann, Aldrich et al. 2003, Nelson 2002, Winter 2005, DOSI, Nelson 1994, Aldrich 1999).

The dynamic representation of organizations and the economic environment has made it possible for evolutionary theory to become an integral part of research on organizational strategy, behavior, learning and change. In this view, the firm is no longer seen as being driven solely by the primary goal of profit maximization but also by its fitness and survival in the environment in which it operates (Arena and Lazaric, 2003). Cohedent and Llerena (1998) have attempted to define evolutionary theory as one "which explains the structure and the behavior of a firm as an emergent property of the dynamics of interactions of both its constituent parts among each other and of the firm itself within its environment" (Cohendet, Llerena 1998) p. 10. Due to this focus on dynamics and change, evolutionary thought has been widely applied in studies on rapidly evolving technological environments (Tripsas, Gavetti 2000, DOSI, Nelson 1994, Vincenti 1990).

While some research has been done on the interactions of firms with their environment, this study will focus on the dynamics present at the micro level of the firm. Here also, Nelson and Winter's work had a great influence as they offered a realistic portrayal of the microbehavior (organizational routines) that can account for system level effects (Murmann, Aldrich et al. 2003).

2.2.2 Organizational routines and routine bundles

The concept of routines, as developed by Nelson and Winter (1982, 2002) has spurred a lot of debate in multiple areas of social science (Cohen, Bacdayan 1994, Becker 2008, Becker 2004, COHEN, BURKHART et al. 1996, Feldman 2000, Zollo, Winter 2002a, Nonaka 1994, Lazaric 2000, Miner 1990)(Lazaric 2000). Much of this past research has regarded routines as stable patterns. The routine itself was not regarded as being subject to change; the circumstances in which it operates were seen as changing due to the newly generated routine.

Feldman (2000) and Zollo (2002) disagree with this view of stable and unchangeable routines. Recent studies have taken a deeper look into the routine and have uncovered the changing nature that resides in

the routine themselves. As routines cannot be separated from the social factors, humans, that create them or enact them, routines receive attributes that actors associate with them. Since the works of Feldman and Pentland (2000), studies have incorporated the changing characteristic of routines when looking into knowledge development, organizational learning or routine evolution.

As the concept of organizational routines has been expanded and changed, reaching a clear definition of the term has proved to be an intricate challenge. Becker's (2004) review of routine literature offers a view on the complexity of the concept (Becker 2004). In this thesis, routines will be regarded as clusters of behavior and action which, through an evolutionary process, become embedded in the organization and come to represent the way in which employees recognize things are done in their company (Bessant, Caffyn 2001, Nelson 1995). Thus routines are not obvious to identify, nor are employees always aware they are performing a routine (Kilduff 1992).

As argued earlier, an evolutionary perspective helps in understanding the "inner workings of the firm" (Winter 2005) as it envisions organizations as evolving systems nested in other evolving systems at higher levels of analysis (Aldrich 1999). The evolutionary perspective has been largely used in identifying change and development of routines and whole organizations (Feldman 2003, Lazaric 2000, Becker, Lazaric et al. 2005, Becker, Zirpoli 2008, Nelson, Winter 2002).

As the evolutionary approach attempts to explore the content of the firms black box by investigating the mechanisms that shape firms behavior (Gossart 2008) firms have been viewed as functioning according to routine(Nelson and Winter, 1982). Routines have thus taken a centre stage in the analysis of evolution of organizational processes. Routines may be bundled into complementary sets, even tightly coupled at the organizational level and play a major part in driving the fates of the organizations that carry them (Levinthal 1991)

While studies of individual routines and their evolution abound, few authors have focused on bundles of routines rather than taking each routine at a time (Aldrich 1999). This study continues along the lines of research into the effects of routines upon the evolution of processes as routine bundles.

A routine bundle can be viewed as a group of routines and patterns of behavior that is employed in achieving the organizations' strategic goal. If we are to consider a hierarchical order of organizational capabilities, we would have at a first level, individual skills (Winter 2005), followed by organizational routines that make use of multiple person skills in attaining an action pattern, different patterns that come together at a third level in developing a cross-departmental process. Given the lack of in-depth study into routine bundles, this study does not attempt to promote a generalized definition of routine bundles.

Nevertheless, for the purpose of this research, routine bundles are viewed as recurrent patterns of action being formed by multiple routines, employed at different times in different parts of the organization with the purpose of realizing a specific goal.

Routines, and by extension routine bundles, in evolutionary theory are seen as being created through an evolutionary cycle of variation, selection and retention ((Nelson 2002, COHEN, BURKHART et al. 1996, Nelson, Winter 2002, Nelson, Winter 1973, Zollo, Winter 2002b). Nelson and Winter's model of routine evolutionary creation was inspired from biology, which also gave rise to the much contested phrase "routines as genes" (Becker 2004, Hodgson 2003).

"The theory proposes that the variable or system in question is subject to somewhat random variation […] and also there are mechanisms that systematically winnow on that variation. Much of the predictive or explanatory power of the theory rests with its specification of the systematic selection forces. It is presumed that there are strong inertial tendencies preserving what has survived the selection process" (Nelson 1995).

Critics of such an approach have pointed out the dissimilarities between evolution in the social and biological domain and claim that the two domains differ greatly at the level of details and units of analysis (Buenstorf 2006). Authors like Hodgson (2008), Knudsen (2006) and Aldrich (1999) have presented arguments for an evolutionary theory that stretches and enriches the biological formulation of a model for social sciences, taking into consideration the obvious differences between sciences (Aldrich 1999, Hodgson 2003, Knudsen, Hodgson 2006). According to Aldrich (2005) if "processes generating variation and retention are present in a system, and that system is subject to selection processes, evolution will occur".

One notable contribution has been that of Zollo and Winter (2002) in reshaping the variation-selection-retention model of routine creation and evolution by including the replication step. This steps considers the distinction between biological entities and social entities (Zollo, Winter 2002b).

2.2.3 The Variation-Selection-Replication-Retention evolutionary model
The classical variation, selection, retention model complemented by Zollo and Winter (2002) makes a clear division between retention and replication processes in routine or routine bundle evolution. With the inclusion of replication, Zollo and Winter address the issue of diffusion of selected information to different parts of the organization where it can be put to use (Zollo, Winter 2002b).
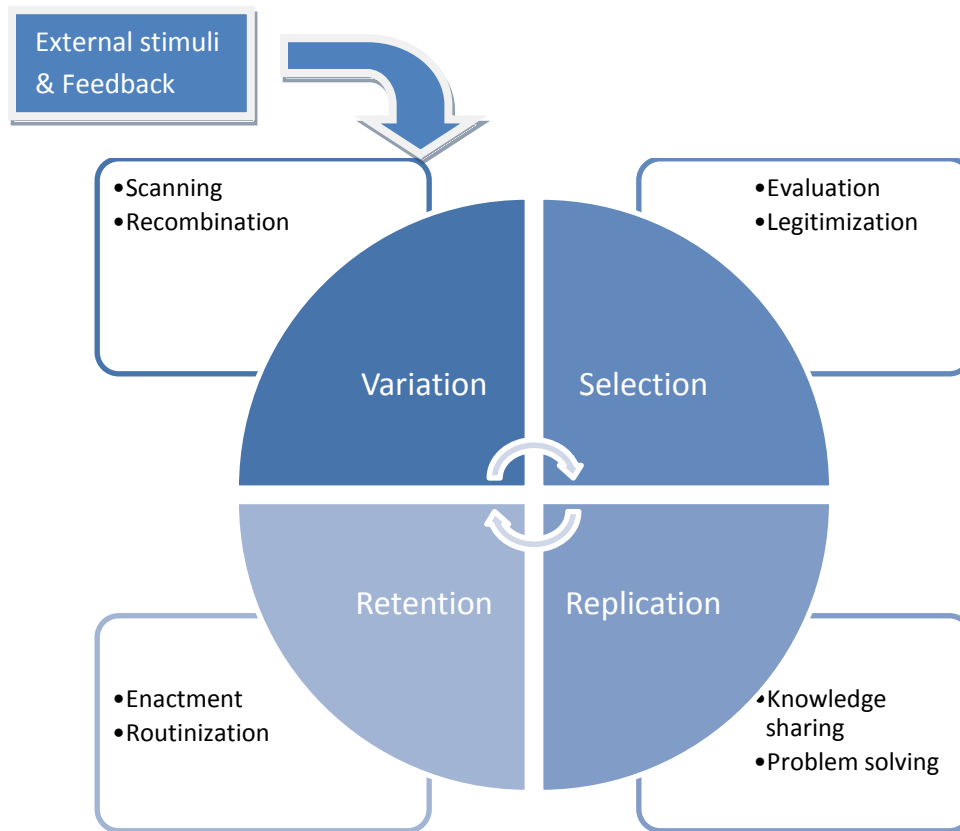
Figure 1: *Routine evolutionary cycle and knowledge creation (adapted from Zollo and Winter 2002)*

Variation represents any departure from what is considered to be routine or tradition. These novelties derive from the existent state of the organization and are influenced by both internal and external factors (Aldrich 1999, Zollo, Winter 2002a)(March 1991). Intentional variations occur through organizations' initiatives to seek and generate alternative solutions to problems. Firms research, scan and explore across technologies and markets in order to identify new opportunities (Nelson, Winter 1982, March 1991, Güttel, Konlechner 2010). Organizations thus develop routine sensing activities for observing the firms' internal and external environment. In this line, Miner (1990) also observed that variations occurring at an organizational level arise from processes that are not fully controlled by management; they are simply part of an evolutionary process.

Created variations are then subjected to a **selection** process. This second evolutionary phase occurs when the new created unit is selected or (Nonaka 1994)other units are selectively eliminated. New ideas are subject to organizational internal selection pressures to determine capacity to enhance the effectiveness of

existing routines and activities (Nonaka 1994, Nelson 1995, Zollo, Reuer et al. 2002). According to Zollo and Winter (2002), selection pressures arise from firms' past experiences and already established legitimization processes. In a study on selection pressures in firms, Durand (2001) argues that organizations engaged in developing new products and new technological standards experience an increased selection pressure than those following established norms(Durand 2001).

Selected variations are further **replicated** within their own area of applicability or are dispersed to various levels of the organization. In their study on learning and the evolution of organizational capabilities, Zollo and Winter (2002) have adapted the classic evolutionary model of variation-selection-retention and have included replication. Through the replication mechanism, Zollo and Winter make the distinction between biological entities and organizations. Replication thus accounts for the diffusion of selected novelty to different parts of the organization where the novel approach can be utilized. Apart from its role in diffusing newly selected variations, replication also serves as a way to generate more information as the newly adopted variations are implemented and their performance monitored. Replication of routines can be performed via codification of selected information or practice, but it can also lead to generation of new data on the performance implications of the routines employed.

The forth step in the evolutionary model involves the operationalization of a **retention** mechanism for the maintenance of the selected variations. On the employee level, retention within organizational routines occurs when people turn variation into part of the whole story (Feldman, Pentland 2003). As to what exactly leads to the retention of the implemented variations, some researchers have connected retention to the former replication phase as indispensable in maintaining the selection made and preventing dissipation (Aldrich 1999, Miner 1990). Embeddedness of selected variations has led some authors to argue that retention can lead to inertia and rigidity due to firms' lock on certain routines and traditions that have been replicated over time (Gilbert 2005). Others have regarded retention as a process through which new variations can occur (Furneaux, Tywoniak et al. 2010).

The VSRR evolutionary process will be used in this study to give an understanding of the dynamic change present at the r(Aldrich 1999, Levinthal 1991, Durand 2001)outine bundle level of analysis. While some studies have researched into how entire organizations evolve (Levinthal, Posen 2007)}}, others have taken a closer look at the inner processes of the firm (Feldman 2003, Zollo, Winter 2002a, Becker, Lazaric 2010, Winter, Szulanski 2000). However, the body of literature that deals with research on the entire evolutionary cycle is quite limited. With some exceptions (Feldman 2003, Aldrich 1999, Feldman 2000, Zollo, Winter 2002b), most studies have focused on one of the evolutionary steps and on identifying the changes in a given identified routine (e.g. hiring routine). The present research proposes to

cover this **identified gap** by contributing to the routine bundle literature body and by analyzing the evolution of the bundle through the entire evolutionary cycle.

2.3 Research focus – linking cradle to cradle with evolutionary theory

This section will bring together the two approaches described above, the cradle to cradle eco-effective tool and the evolutionary theory of organizational routines.

Being a relatively new concept, Cradle to Cradle has yet to receive the academic attention the eco-efficient tools and processes have gained. Looking at the present literature, Cradle to Cradle has been observed and defined mainly through a holistic, static lens of implementation steps. This approach however needs to be complemented by a more dynamic perspective and research if it is to provide both academics and practitioners with a more detailed and workable concept. By looking at some of the criticism surfacing in traditional and social media, it becomes apparent that research into the actual workings of Cradle to Cradle in a dynamic, corporate environment is expected and could provide the concept with a more robust framing.

Advances in evolutionary theory with its focus on exploring the insides of corporate developments and organizational processes offers the dynamic, detailed perspective the Cradle to Cradle concept would benefit from. By looking at companies that have worked with and implemented the eco-effectiveness tool, insights into its evolution within the actual business environment are explored.

The evolutionary theory is based on advances from an original state of being (Nelson 1995), which is already present in the companies once the Cradle to Cradle model is applied. The evolution of the organizational routines involved, coming together in a routine bundle, can further shed more light onto how the evolutionary process develops and on what influences the evolutionary steps along the way.

> This chapter provided a presentation of the conceptual framework on C2C and evolutionary theory, with a particular focus on routines. This framework is used throughout the research and serves as basis for the reached conclusions. This section has identified C2C as a critique to eco-efficiency approaches and it has pinpointed the VSRR model as a recent development of the evolutionary cycle.

III.   Methodology

This chapter will present the research methodology and data collection methods applied for this study. The purpose of this chapter is to clarify how research was performed on Cradle to Cradle process implementation in three companies. Firstly, the research philosophy will be presented, followed by the research design and methodology. The basis for choosing grounded theory method is discussed. An overview of the research setting is then provided with the description of case selection, followed by information on the data collection procedure. The data analysis section shows how the empirical data was examined. The chapter ends by explaining some limitations to the approach taken.

3.1 Research Philosophy

The way in which research is conducted may be conceived in terms of which philosophy the researcher subscribes to. As mentioned by Henwood and Pidgeon (1992), "the gathering, analysis and interpretation of data is always conducted within some broader understanding of what constitutes legitimate inquiry and warrantable knowledge" (Henwood, Pidgeon 1992).

The epistemological construct and the inquiry into gathered data taken in this thesis are "concerned with understanding the fundamental meanings attached to organizational life" (Lewis, Thornhill et al. 2009). In line with the intepretivist philosophy, emphasis is put on the "emergence of concepts from data" rather than testing a priori theory and concepts in experimental processes (Henwood, Pidgeon 1992). This study assumes that the Cradle to Cradle business model and the cases presented provide a context specific research field. Nevertheless, as Eisenhardt and Graebner (2007) explain, the extension of literature resulting from qualitative case study research builds a bridge to deductive approaches that use data to test the theory. As a consequence, the conclusions reached in this thesis are theoretical propositions which can be further tested by deductive studies.

Using **theory building from case studies**, a constant comparison and relation was kept between theory and data throughout the research process (Lewis, Thornhill et al. 2009, Eisenhardt 1989, Corbin, Strauss 1990, Morse, Barrett et al. 2002). Grounded theory building leads to the generation of theory through analysis and review of data gathered through qualitative methods. Thus theory is presented as the outcome of the research process and not its initialization. No assumptions or hypothesis were formulated prior to starting the research process. The propositions presented in the final data analysis have been

generated through an iterative action between data and theory. In order to avoid an unstructured and unfocused study, some degree of delimitation was necessary. This delimitation is evidenced in the three main research questions.

3.2 Research Design and Method

A case study research design has been applied in order to answer the three research questions as the research "proposes an examination of a contemporary phenomenon in its real-life context" (Yin 2003, Yin, Yin 1981). Inspired by Eisenhardt (1989), Eisenhardt and Graebner (2007) and Yin (2003) a **multiple case** strategy was chosen (Eisenhardt 1989, Yin 2003, Eisenhardt, Graebner 2007). As Yin (2003) argues, in a multiple case study "analytical conclusions […] will be more powerful than those coming from a single case alone" (Yin 2003). Eisenhardt and Graebner (2007) also consider multiple cases as enabling "broader exploration of research questions and theoretical elaboration" (Eisenhardt 1989).

One limitation of the multiple case strategy is the risk of the independent researcher not having the required resources and time in order to fully grasp and understand the uniqueness of single cases (Yin 2003). While considering this risk, the study of the Cradle to Cradle implementation is better served by looking at multiple occurrences and by examining communalities and divergent issues among different cases. The multiple case approach also provided the diversity and variation needed to further deepen the validity of findings.

A **qualitative approach** has been applied to this thesis as the aim is to "understand phenomena in context-specific settings"(Golafshani 2003). The results of this study seek to understand and extrapolate researched situations (Golafshani 2003) and provide a basis for further quantitative studies.

In line with Eisenhardt (1989) and Strauss (1990), this thesis adopts an **inductive theory building methodology** (Lewis, Thornhill et al. 2009, Eisenhardt 1989, Corbin, Strauss 1990, Glaser, Strauss 1965). This methodology has been preferred to a purely deductive approach as the research wants to better understand and explore the Cradle to Cradle concept as it is perceived by the main parties involved. Also, the focus of the research is to allow concepts to emerge from the themes identified in gathered data rather than testing of hypotheses (Lewis, Thornhill et al. 2009).

3.3 Research setting

At the time this research was carried out there were approximately 105 companies worldwide that applied the Cradle to Cradle principles (MBDC, 2012). Three case companies were chosen to be the main focus of analysis in the thesis:

1. **Royal Mosa**, a tile producer based in Maastricht, the Netherlands. Founded in 1883, it has recently gone through a change in ownership and management. This lead to a shift in production focus from "more at low quality" to "less at better quality". Royal Mosa received the Cradle to Cradle silver certificate after implementing the C2C requirements over a period of 2 years from the moment the concept entered the organization.

2. The newest founded company in the study is **BBLightconcepts**, a LED lightsystems manufacturer. Chiel Bekker started the company in 2004 which is currently based in Doetinchem, the Netherlands. BBLightconcepts' first contact with C2C was in 2007 and the company currently holds a C2C recognition from MBDC.

3. **Gabriel A/S**, a Danish textile producing company with the head office in Aalborg, Denmark. Founded in 1851, it is the company with the most experience in environmental criteria and labels from the three cases. Its contact with C2C came through client requests and enquiries in 2006. Gabriel now holds a C2C silver certification on part of its range of products.

As a certain degree of flexibility is a key feature of case study theory building methodology, changes and adjustments were made to the initial research setting over the course of data collection (Eisenhardt 1989). Case companies as well as interviewees were added or eliminated from the data gathering process as research progressed.

The case selection occurred through a deliberate process, rather than a random consideration of possible companies (Yin 2003, Eisenhardt, Graebner 2007). An initial interview with EPEA Copenhagen representatives resulted in a list of suggested organizations that could be part of this study. Consequently, five selection criteria were considered:

- Cases had an **interest in C2C** within their organization as part of their environmental agenda and the implementation process had to be well under way.
- Companies had to be **of medium size** in order for one researcher to be able to thoroughly collect and examine the data in the given time.
- Organizations had to be **implementing C2C for at least 5 years before research started** in order to identify C2C organizational routines.
- The final criterion was related to the **availability and willingness** of the case companies to allow contact with key employees and informants with knowledge of C2C implementation.

3.4 Data collection

3.4.1 Primary data

As is frequent in qualitative research (Lewis, Thornhill et al. 2009, Eisenhardt 1989, Yin 2003, Bryman, Becker et al. 2008) the primary data for this thesis was gathered through a series of **semi-structured individual interviews.** At one interview two respondents were present. Telephone interviews were largely taken, with two interviews being done in person. When possible, in person interviews were preferred as well as an on-site visit to company location. While the disadvantages of telephone interviews compared to in person interviews were considered (Lewis, Thornhill et al. 2009), repeated conversations and follow-up calls helped in achieving a tighter interconnectivity between interviewer and respondents. Interviews lasted on average 60 minutes, with some going on for a longer time (the longest one was two hours). In all cases, **hand-written notes** were taken and consulted during the review of data. Where more information was needed or the data was unclear, a note was made for a follow-up interview. All interviews were **tape-recorded** and later transcribed. The transcriptions provided a reliable source of citation during the research analysis. A total of 17 interviews were conducted which resulted in 133 pages of transcriptions.

In all instances, an **interview guide** was used for the interviews. Respondents were first asked to describe their role within and collaboration with the company. This information would point to the role of the interviewee in the C2C implementation process. Further on, informants were requested to present, to the best of their knowledge, the company history, its main activity field and the environmental issues the organization is facing. The main part of the interview was reserved for descriptions of the development of C2C within the company and what this meant in terms of changing routines or adding tasks to current employee responsibilities. The interview partners were also asked to mention the struggles and problems they faced in adhering to the C2C principles and how they considered those could have been avoided or dealt with. The interviews were generally very open thus allowing the respondent to set the focus of the conversation. Over time, as constructs became to emerge, during follow-up interviews, the conversations were targeted on specific elements of emerging theory. At the start of data gathering, the interviewees were allowed to bring in new information pertaining to the C2C implementation. In later conversations, the interviews became more focused on specific topics related to the evolution of the C2C routines.

Three respondent types were interviewed. The persons in charge of C2C implementation in the case company, often the same persons who brought the concept to the attention of the organization were interviewed to understand the main reasons and decisions taken for C2C implementation. A company employee specialized in technical aspects offered information on the practical issues confronted with the C2C process and also allowed for a better understanding of the specific activities related to C2C. EPEA

and C2C consultants provided a different perspective on the implementation of C2C criteria while also adding details of the whole organization environment during the C2C process.

Initial **interviewees were identified** and contacted through literature and internet search on C2C. EPEA Copenhagen was contacted first. During a pre-research interview and after the decision on the three case companies was taken, the EPEA Copenhagen contacts provided information on possible respondents from each organization. The company interviewees suggested new persons from company staff or other consulting organizations who were involved in the C2C process.

3.4.2 Secondary data

Secondary data sources were used for triangulating the findings emerging from interviews, to gather more precise facts on dates the interviewees were not sure of, as well as to have a more complete understanding of the company industry. Sources of secondary data include company documents (annual reports, sustainability or C2C reports, presentations, websites), media publications, internet websites and academic papers. Although the environmental concerns of three main industries in which the case companies operate are not the prime focus of this study, specialized websites, publications and, in some instances academic papers were consulted. This has provided a clear view on the impact C2C would have on the company activity regarding natural and social environment.

3.5 Data analysis

Data analysis was carried out in accordance with qualitative, inductive research strategies (Henwood, Pidgeon 1992, Lewis, Thornhill et al. 2009, Yin 2003, Eisenhardt, Graebner 2007). A detailed **case history and timeline** were prepared for each organization. This allowed the identification of the main developments within the company that might have influenced the decisions taken around C2C implementation. Key C2C routines were identified along the timeline which helps in creating a clear image of the evolution of the process.

A **within-case analysis** was conducted in each of the case companies (Lewis, Thornhill et al. 2009, Yin 2003). The analysis revealed key research issues such as the C2C related routines and their influence on the evolution of the C2C implementation within the company. Five sub-codes were identified and were applied to all interviews. Each statement was associated with only one code. A constant iterative process between theory and data was performed. This gave rise to more insight into potential theory contributions and allowed for more elements to be included in the observed constructs.

In order to control as much possible for researcher's subjective understanding of responses, **consensus validation** was performed. By sending all personal citations as well as the form in which they were used

in the thesis to the respective respondents, correctness and interpretation of information were checked. Feedback from respondents on the findings of each case was encouraged and taken into consideration.

Finally, within the **cross-case analysis**, findings were analyzed and compared, leading to an initial research model. Reference back to collected data was made, while the model was also contrasted with the theoretical background. The iterative process between theory and data was thus continued as it is usual in grounded theory research (Eisenhardt 1989, Corbin, Strauss 1990, Eisenhardt, Graebner 2007).

3.6 Limitations

During data collection and data analysis, several limitations of the thesis were identified and taken into account when concluding the study.

As the interviewer and respondents were of different nationalities (Danish, Dutch, Romanian), all interviews were conducted in the English language, a non-native language for the participants. While this offered a common setting for all discussants, it can be considered a limitation due to the possibility of misinterpretation or difficulty in expressing the desired meaning. Having this in mind, follow-up interviews and consensus validation offered both the interviewer and interviewees the chance to correct any misunderstandings that might have arisen.

Over the course of research and data collection, interviews with BBLightconcepts and Gabriel targeted both managerial and technical staff involved with C2C implementation. The interviews conducted at Royal Mosa were confined to the sustainability management level. Although this offered a very good overview of the whole process of implementation at Royal Mosa, it can be a limitation that no technical staff was interviewed. In order to overcome this limitation, a two day on-site visit was performed during which the company factory and offices were presented and contact with technical personnel was established. Questions were asked on the location and field notes taken throughout the duration of the visit were later used in interviews.

Research in this thesis partly involved industry specific knowledge and information on production issues. As the researcher does not have a technical background of the industries the case companies activate in, this limitation was considered and addressed. By seeking expert opinion and clarifications, a better understanding of the technical aspects was achieved.

3.7 Validity and reliability in qualitative research

Seen from a qualitative research perspective, issues of validity and reliability are understood as "trustworthiness, rigor and quality" (Golafshani 2003). The difference between "bad" and "good" research often comes down to testing and increasing the rigor and quality of the study. This was done through triangulation of data sources and collection methods, as well as through attention to reflexivity issues.

3.7.1 Triangulation and reflexivity

By **triangulating** data collection and sources of data, interpretations given to the findings are expended or confirmed, enforcing validity and reliability of research.

This study has used **varied data collection methods**, with interviews as the main source of data. Where possible, field notes were taken and compared with the interview results. During interviews, notations were also logged and triangulated with later transcriptions of the conversations.

Multiple sources of data were also used. Once the interviews with company personnel were taken, EPEA and external stakeholders were contacted and interviews were conducted. Experts' opinions strengthened data reliability and offered new perspectives on data interpretation. The interview data was also complemented with document analysis, including annual reports, website information, research reports and own observations.

Regarding **reflexivity**, researcher bias was considered and taken into account over the course of data collection and analysis. If replications of this study are attempted, it is important to note that the researcher's own experiences and assumptions have impacted on the steps of the research thus shaping the research process (Callery, Hall 2001).

This chapter has introduced the methodologies and the case study research design that have modeled this thesis. Furthermore, the research setting has been illustrated and data collection methods have also been presented. Limitations of these choices were also considered.

IV.   Data description

This chapter provides the reader with information on the three case companies selected for the inductive study on the organizational routines implemented under the Cradle to Cradle process. Throughout the chapter, data will be provided on the company history, products, first contact with Cradle to Cradle and the environmental issues faced in the production process. Within the incase analysis, the information gathered from each company will be reviewed with the scope of identifying the main points and phases in the implementation of the C2C process that will help in answering the three research questions mentioned at the beginning of this thesis for each case in particular.

4.1 Introduction

As mentioned previously in Chapter 3, one of the main important criteria in case selection was the presence of the Cradle to Cradle implementation in the company. By looking at the MBDC and EPEA data base and through the initial search interviews taken with EPEA personnel in Copenhagen, the following companies have been chosen:

- **Royal Mosa** - a wall and floor tile manufacturer based in Maastricht, The Netherlands
- **BBLightconcepts** – a producer of LED illumination systems based in Doetinchem, The Netherlands
- **Gabriel A/S** – a furniture textile manufacturer based in Aalborg, Denmark

All three companies have Cradle to Cradle certified products or have implemented the Cradle to Cradle principles in their products and strategy. They have all successfully collaborated with the Cradle to Cradle institutions in achieving a Cradle to Cradle recognition. By studying the way in which they have tackled the C2C process, more insight is gained into the routines they activated and utilized in dealing with the C2C requirements and thus conclusions can be drawn on how the bundle of routines evolves and develops and what makes it be retained in the organizations.

All companies are based in developed countries, Denmark and The Netherlands, both with declared focus on environmental policies and strong positions on company responsibility towards natural and civil society[2] [3] (van der Weele, interview). All three organizations are small or medium-size enterprises with

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[2] The Netherlands pursues a successful environmental policy that is resulting in cleaner rivers, reduction in carbon emissions, reduction in waste streams, and cleanup of contaminated soil (http://english.verkeerenwaterstaat.nl)

extensive experience in their field of activity, thus it is important to note that the Cradle to Cradle principles have been applied to existing structures and routines. As mentioned in Chapter 2, the Cradle to Cradle process in existing companies with already developed routines will entail a transition process (Braungart, McDonough et al. 2007, Braungart, McDonough 2009) that will be developed on the basis of the situation present at the time of Cradle to Cradle commencement. This process gives rise to a set of routines which has been named in this study the C2C routine bundle and which will be analyzed later on.

4.2 The case of Royal Mosa: a C2C charter organization

Based in a residential area in Maastricht, The Netherlands, Royal Mosa is an independent wall and floor tile manufacturer founded in 1883 and currently owned by the Dutch equity firm Egeria. The company employs 600 people (Dorien van der Weele, interview), and according to website information and staff declarations, wants to be a leader in sustainability and innovation in tile surfaces (Royal Mosa, website). Towards achieving this set strategic goal, Royal Mosa has chosen the Cradle to Cradle approach.

> "C2C was chosen as the approach and now we are almost fully certified in C2C and also
> our management sees this as something to stay and then it was added to the mission."
> (van der Weele, 2011, interview)

Before going deeper into the rationale behind the C2C implementation and the identification of C2C routines, a clarification of environmental challenges within the industry and ways of meeting them is needed.

4.2.1 Environmental challenges

Royal Mosa is one of the companies activating in the ceramic tile system industry. Environmental concerns are raised with regard to energy consumption and water and air pollution due to the use of chemical components.

Energy

The energy consumed during manufacturing of ceramic products is primarily used in forming, glazing, drying and firing. Costs for energy consumption can add up to 30 percent of the total production costs (staywithclay.com). Energy sources are also a cause of concern, as natural gas and fuel oil are the most used in the firing and drying operations.

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[3] The Danish Government's plan "Our Future Energy" seeks to create green growth and help the country convert to 100 percent renewable energy use by 2050 (http://kemin.dk/en-us/newsandpress/news/2011)

Water and air pollution

Raw materials used are mainly of natural origin: clay and sand (van der Weele, interview), to which glazes and pigments are added to create the range of colors and surfaces (House Energy, website). The main environmental issues are the ingredients used in the glaze and pigments. These ingredients can contain lead and acidulous substances harmful to animal and plant life. Also, during the manufacture process, large quantities of fine dust can be released into the area surrounding the plant site, be inhaled by workers and communities living in the proximity of the plant.

Process water produced from manufacturing steps can include pollutants suspended and dissolved heavy metals (lead or zinc), sulfates and organic matter. Treatment of the wastewater at plant site is thus paramount in avoiding contamination of rivers and natural sites.

Hazardous waste

Once it has reached the end of life, the tile product becomes part of construction waste. Due to glazes and the multitude of ingredients in tiles, separate waste collection is practiced by most countries. In Denmark, 90 percent of construction waste is recycled, with tiles being collected separately from unglazed or other clean materials. However, tiles and other construction waste is normally downcycled to other construction projects as sub-bases and concrete aggregates.

As all these issues are considered and addressed in the C2C approach, it becomes a relevant strategy to consider in tile manufacturing industries.

4.2.2 The road to C2C and main reasons for implementation

As described in chapter 2, organizational routines and, by extension the routine bundles are influenced and developed under a certain context in which the company activates. Therefore, a description of the company's recent history and roadmap to C2C is considered important in understanding the reasons and the future implementation of the C2C concept (Figure 2).
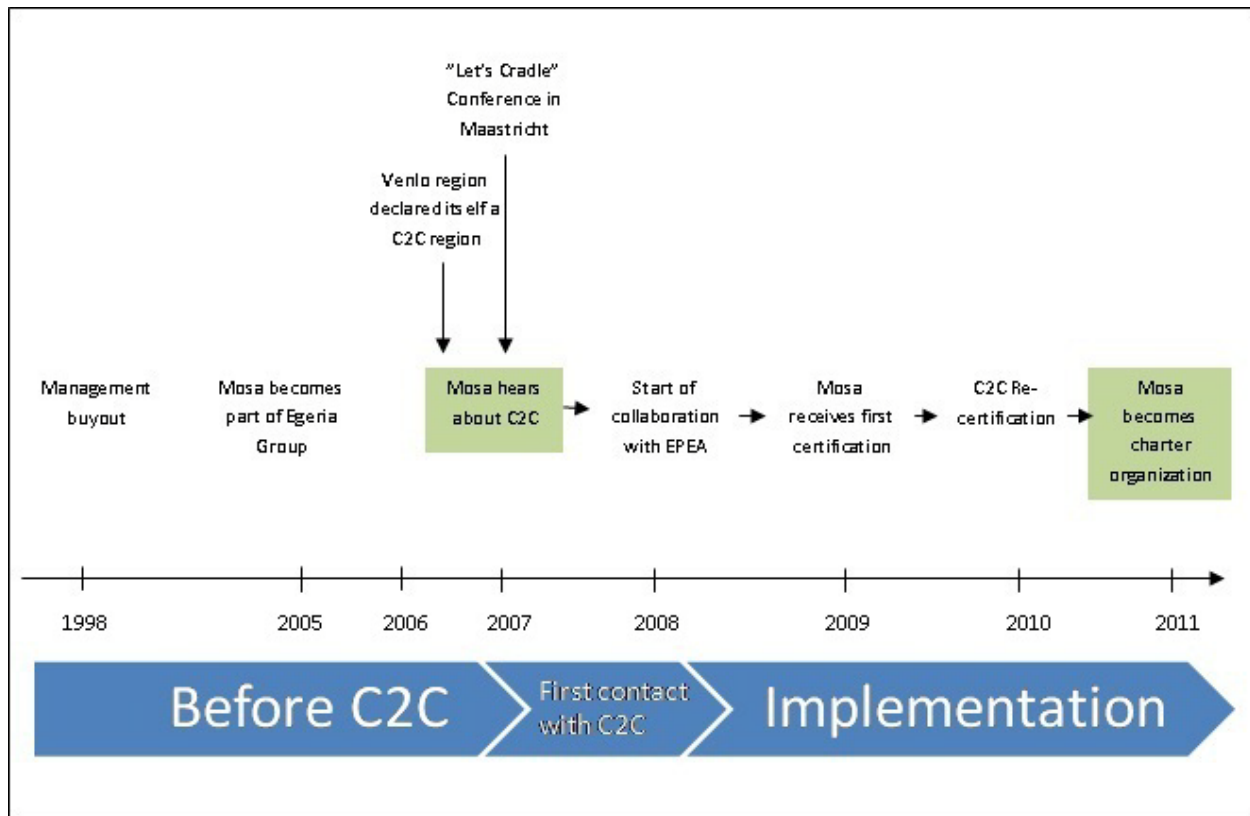
Figure 2: *Overview of History and Timeline of Royal Mosa C2C implementation*

Before C2C

The recent history of Royal Mosa has seen a shift in management and product orientation. Before the year 1998, "Mosa was part of a larger corporation and the focus was on producing high volume at a low price, and we were in the wrong part of the world for that. So the company was in a bad situation" (Van der Weele, interview). In 1998 Royal Mosa went through a management buyout when the current management team took over. This led to a complete change in strategy to lower volumes of production and higher quality products. The focus was "moved to design, innovation, flexibility and being close to the main customers, architects" (van der Weele, interview).

> "The technical installations had to be updated because of bad maintenance. They invested
> in, for instance flexibility, so that we can make quite small series on request of customers
> for specific projects" (van der Weele, interview).

According to Dorien van der Weele, the sustainability manager at Royal Mosa, these updates were also partly driven by sustainability and compliance with local and European environmental legislation. Due to

the decision of continuing operations in the middle of the residential area in Maastricht, compliance issues regarding pollution, fine dust reduction and CO_2 were taken into consideration (van der Weele, interview). This radical change in internal structure and focus was the catalyst for the C2C concept to enter Royal Mosa.

In June 2005, the investment group Egeria added Royal Mosa to its firm portfolio (Egeria, website). "Egeria only has companies in their portfolio that they think are somehow sustainable, that have been there for a long time, but also looking for innovation" (van der Weele, interview).

First contact with C2C and reasons for implementation

Royal Mosa first came into contact with the C2C concept during the "Let's Cradle" conference organized in Maastricht in the autumn of 2007.

> "Our management got enthusiastic and this is how it all started at Mosa" (van der Weele, interview).

The Venlo region and the Limburg province, where the city of Maastricht is located, had taken a high interest in C2C. In 2006 Venlo declared itself to be the first region in the world to embrace the cradle to cradle principle (Regio Venlo, website). A series of events linked to C2C were thus organized at the regional level. According to Dorien van der Weele, "C2C was taken as a theme by the province in order to promote the companies and the region." On the basis of this interest, the local government-owned investment bank NV Industriebank LIOF, had taken up a "First step" initiative to provide funding to 20 small and medium sized companies in the province and to mark the beginning of C2C (Skublak, interview). Royal Mosa initially applied for funding, but was deemed not eligible on the grounds of being too large (Skublak, interview).

Nevertheless, prospects of future facilities from municipality, management enthusiasm and the company decision to remain in the residential area and not relocate production were considered strong reasons to go ahead with the C2C implementation process, even without direct financial incentives.

> "It is also a way to distinguish ourselves from other tile companies and it gives people something to be proud of" (van der Weele, interview).

Implementation and main challenges

The first step taken by Royal Mosa in working with the C2C concept was an internal competition on sustainability organized throughout the company. The goal of the initiative was to spur interest among the employees at all levels.

> "Everybody had to send in ideas on how to improve on sustainability and it was really regarding all aspects from coffee cups to production improvement, to furniture, it could have been anything" (van der Weele, interview)

The competition revealed a number of winning projects from which 12 multidisciplinary working groups were formed to develop the ideas (van der Weele, interview). Some of the groups still continued their work at the time research for this thesis was conducted. "This is what started Cradle to Cradle at Royal Mosa" (van der Weele, interview).

In order to further implement the Cradle to Cradle principles, in 2008 the co-operation with the consultancy company EPEA was started. EPEA was contacted by Royal Mosa marketing director, Guy Geuskens, and a kick-off meeting was organized with the main departments of the company: marketing, Research and Development, engineering, CSR. Marketing was seen as an important part of the implementation plan.

> "It is very important to have marketing in there as well, because it is important how you communicate to the public what you are doing" (Skublak, EPEA, interview).

After the initial decision of Royal Mosa to have the product analyzed by EPEA and the product context and scenario elaborated, the next step was taken in managing and dealing with the issues arising from the passive-positive list assessment. Employees were assigned to the different tasks, both according to EPEA recommendations and also based on internal selection and past experience.

> "Mosa decided to do the first steps, to analyze the components of floor and wall tiles and put the product in context. This meant defining whether it is a biological or technical nutrient. Ceramic tiles are part of a technical cycle. We tell them which departments or subjects we need, but Mosa knew internally who to choose based on their expertise in health and safety" (Skublak, EPEA, interview).

Upon completion of analysis of product components and gathering of data from suppliers of raw materials in collaboration with EPEA, Royal Mosa worked internally on the identified problems. Eliminating acidulous substances and lead from products, closing cooling water cycles, implementing new renewable

source energy solutions, recycling of rejected tiles and setting a take back system in collaboration with a waste management company were the main procedures taken by the company.

The Cradle to Cradle Silver certification was received by Royal Mosa in 2009, a year and a half from the start of the implementation process. On January 2011, Royal Mosa received and signed the Cradle to Cradle Organizational Charter which both recognizes the company's achievements and commits it to further development on Cradle to Cradle principles.

> "EPEA give this to companies that have a leading role in their branch for implementing the principles of C2C. It is also a commitment of further implementation of C2C and you are obliged to develop a vision for the next 10 years, a kind of innovation road map" (van der Weele, interview).

The amount of human capital involved in the process shows the penetration of the Cradle to Cradle implementation throughout the company. The time that elapsed between the first decision up to the certification and the present developments in the take back business concepts and heat reduction and recycling solutions, has put a strain on the employees' usual activity.

> "It is very time consuming. Not that people do not want to or like to do this, but it is a lot of work and this approach can only be successful if it is driven from top management. If they do not believe in it, the people will not spend all this time. Otherwise you can make a nice brochure, make a presentation about it, but that does not mean you implement C2C in all the processes of the company" (van der Weele, interview).

One other identified challenge that impeded the rapid development of the process within the company that lead to certification was seen to be the lack of clarity in certification criteria required by EPEA. The procedural nature of the C2C implementation brings into discussion new items at different times. The newly identified challenges have to be constantly added to the tasks of the employees which can result in confusion.

> "Maybe it would have been easier of the criteria for certification would have been a bit clearer. The feeling was like you were cycling up a hill and once you think you are there, you need to go a bit further because there is another hill in front. What EPEA does is guide you and coach you until you find the solutions yourself, but it is not easy. The advantage is that, by doing this you collect a lot of knowledge about the product and possibilities" (van der Weele, interview).

4.2.3 Identification of the C2C routines

The new management's focus on sustainability through Cradle to Cradle has thus given rise to both short term and longer term routines that would permeate not just the production department, but the whole organization at Royal Mosa.

The collaboration with the certification body EPEA and the internal planning around the C2C implementation gave rise to tasks that were not normally undertaken within, for example, the production, design and research and development departments. Further research on the evolution of the C2C related process and the affected tasks and divisions within Royal Mosa, lead to the identification of the organizational routines created or shaped around Cradle to Cradle.

Evaluation Routine and information gathering

In relation to product design and purchasing, on which the main effort was initially concentrated, evaluations of components and suppliers triggered a shift in the routines further down the pipeline to the actual production process. Collection of information on ingredients from own production, but also from suppliers is a routine specifically done on the grounds of C2C. The introduction of EPEA as a facilitator and repository of information from suppliers that do not wish to disclose their recipes to clients represents another added step to past routines. Contracts with suppliers reluctant to share the information requested and refusing to sign Memoranda of Agreement with EPEA were closed and new suppliers had to be found.

> "The main job was to collect all information about our ingredients, not only from ourselves, but also from our suppliers. They had to do measurements as well because, in some cases, they did not know exactly what was in their products. If a supplier is reluctant to give all the information to a company, they can give it to EPEA and MAs are signed. Those suppliers who did not want to divulge the composition had to go. You either go with it or you are out." (van der Weele, interview)

In order to align to the steps of C2C design, all ingredients from Royal Mosa and suppliers were thus analyzed by EPEA and feedback was then sent to Royal Mosa on their impacts on human and environmental health, along with a recommendation on whether they would be okay for use, or recommended for phase-out. This analysis made by a third party (EPEA) according to which design, development and production will continue, is a new addition to older routines in each department. Establishing a complete list of ingredients required information from a core team of employees formed

for the specific purpose of implementing C2C. The core team included various divisions across the company.

> "People from the core team had to give this information: our designers, the people from product development, our process technologists, purchasing in some cases, the persons responsible for health and safety were also on the team." (van der Weele, interview)

Operationalization Routine

Once the complete list was established and an assessment of ingredients was elaborated, improvements on the list and substances that should be eliminated were considered according to the feedback received. As the main ingredients for tiles are already of natural origin, the main issues arose in the pigments and glazes which cover tiles and give them color and texture. Acidulous substances and lead had to be eliminated from the composition which in turn lead to a shift in suppliers and glaze recipes.

> "You need feedback and you have to make improvements, a kind of iteration is going on and on. We had some issues in the raw materials, mainly in glazes and pigments and all but a few are now free of acidulous substance and lead. There were a few cases where we changed suppliers because another supplier did have, for instance, a pigment or a glaze without acidulous substances." (van der Weele, interview)

In the C2C terminology, with the conclusion of the passive-positive list – the list with feedback on all reported ingredients, knowledge of the optimal ingredients was made available to design and production employees who had to include it in their usual activities. This new insight would then change the following designs and technical outputs, but also have an impact on the behavior of employees. The passive-positive list is thus activated in practice.

> "Because of C2C, our developers were challenged to try using glazes without lead, whereas before, if they would not have been asked, they would not have done it, or they would not have asked the suppliers if they have such products." (van der Weele, interview)

Moving from product analysis to the scenario identification, evaluation of the entire production cycle revealed that, while made of natural components, wall and floor tiles were deemed by EPEA to be technical nutrients. This has lead to employees thinking of ways in which the product can be reused or recycled.

Training routine

Through the implication of management in the C2C process, Royal Mosa exhibits strategic routines that have been touched by the C2C principles. The sustainability manager, also the person directly linked to the C2C agenda at Royal Mosa, sits on the steering group and brings the C2C development on the agenda every month.

New business models of take back systems are developed with nutrient management companies and experts. Heat measurements and recycling methods are being implemented along the lines of the C2C cycles and as a direct consequence of C2C implementation in production routines.

Royal Mosa personnel have been trained on the new features of C2C implementation that influence their line of work: marketing personnel receive updated information on new certified products, engineers and production employees are challenged to find options on developing recipes in line with C2C requirements.

> "C2C has changed the company culture as we are much more aware of the things that we do and their consequences for the environment. We have made a contract with a waste management company. They will collect the tiles, process them and deliver them back to us as ingredients for more tiles" (van der Weele, interview).

Looking for and implementing advanced and renewable sources of energy has become part of the routine of Royal Mosa employees in production division. Purification of water surges and closing of the cooling water cycle are among the processes that are now a continuous technical routine, while new measurements of water and heat usage are also undertaken.

Communication Routine

Activities on marketing and communication on own products have also seen changes and adaptations. Looking at only C2C related routines, research has shown that they have permeated both internal and external communication at Royal Mosa.

With regard to the external communication and marketing, more explanation is given when referring to C2C to clients and stakeholders than when referring to sustainability actions in general.

> "Sustainability is a word that is already known, but the specifications for C2C and its advantages sometimes need a bit more explanation" (van der Weele, interview).

Sales teams are trained on labels and C2C specifications. Architect visits are organized where the sustainability manager presents the C2C approach and results for the company. The researcher has participated herself at such events where information on how C2C was implemented in Royal Mosa was one of the main issues and regarded as a strong selling point.

One particular aspect encountered regarding communication with third party companies is the creation of C2C collaborative events. Royal Mosa is part of a cluster of organizations hosting meetings on various C2C topics that bring together stakeholders in C2C. This communication endeavor is organized specifically on the grounds of C2C implementation.

> "We are working with C2C companies in organizing C2C cafés where we do not represent ourselves as companies, but we invite guest speakers who present different aspects of C2C" (van der Weele, interview).

On internal communication, Royal Mosa employees are exposed to information on C2C on every report and communication document intended for organization personnel. A systematic focus on C2C in monthly reports is delivering the information to internal stakeholders.

Re-certification routine

Continuous search and flexibility towards improved energy sources constitutes another step in achieving the strategic goals developed under the 10-year vision in collaboration with EPEA. Yearly re-certification of products contributes to the constant evolution of the C2C routines identified.

> "They guide us in the process of C2C implementation still today and there is a meeting every six weeks and we discuss about projects we have identified and about the progress we made" (van der Weele, interview).

Periodic meetings with EPEA representatives take place and consultation of expert knowledge is employed for future development.

> "With Mosa we are continuing our projects, we have goals for 2020 and there is a long term arrangement" (Skublak, EPEA, interview).

With Royal Mosa committing to the C2C charter organization, constant re-evaluation and further improvements are expected to further develop the C2C concept while maintaining it as part of the company strategy.

4.2.4 Summary

This case study describes the introduction and the development of the C2C concept in the tile company Royal Mosa from the main motivations and first contact to the internal routines and tasks that have been affected and changed by C2C. Several routines have been identified in the data analysis process and have been classified according to their main impact on the implementation process.

Routine	Actions
1. Evaluation routine	Gathering of product and supplier information Sending gathered data to external evaluation and feedback from EPEA Creating the complete list of ingredients including recommendations from EPEA Involving multiple departments in the data gathering and analysis process
2. Operationalization routine	The elimination of acidulous substances and lead from pigments and glazes Changing of suppliers in order to accommodated the new requirements Inclusion of optimal available knowledge in employee activities Changing of design and composition
3. Training routine	New collaboration on development of take-back systems of Royal Mosa employees with nutrient management companies Training of employees on the features of C2C Requests of constant awareness on renewable energy sources and water purification systems
4. Communication routine	Reference on C2C is made to clients and stakeholders Labels and C2C specifications are included in sales information Every internal report makes reference to C2C Participation in collaborative events on C2C themes with third party groups
5. Re-certification routine	Regular meetings with EPEA personnel Analysis of current situation and further improvements Becoming and committing to a C2C charter organization

4.3 The case of BBLightconcepts: a company in line with C2C design philosophy

BBLightconcepts is a medium size Dutch company founded in 2004 that uses low-energy LED Technology and durable materials for creating products suitable for large building projects such as shopping centres, office buildings, parking garages (BBLigthconcepts, website). The main product represents LED lightpipes and fixtures for commercial areas. Based in Doetinchem, the company currently employs 28 people and is part of the larger Dutch TKH (Twentsche Kabel Holding) Group. According to company website, TKH Group numbers 3706 (2010 data) employees and intends to be an innovative leading niche player that specializes in the development and delivery of systems and networks for the provision of information, telecommunication, electrotechnical engineering and industrial production (TKH Group, website).

4.3.1 Environmental challenges

Resource depletion

LEDs, or Light Emitting Diodes, compared to traditional incandescent lighting devices, are advertised as more environmentally friendly due to their high energy efficiency and for being mercury free (Lim, Kang et al., 2011). However, research into utilizing LEDs in lighting industry pointed at some health and environmental issues regarding their hazardous waste potential, resource depletion potential and toxicity factors (Lim, Kang et al. 2011).

Questions on these aspects of LED systems production raised the importance of life-cycle analysis of products since they contain resources such as gold, silver and copper. Restrictions also apply on the usage of lead and arsenic as they have the highest toxicity concern.

Hazardous waste

The increased usage and popularity of LED lights along with the concerns mentioned, pave the way to increased legislative measures targeted at electric devices and their disposal.

> "In Sweden we have the recycling fee which everyone has to charge when you are selling an electrical product. Once the product runs out it becomes a cost to the society and the community to dispose of, so a tax is compulsory." (Bergström, interview)

Addressing the environmental issues would require focus on careful resource utilization, product durability, recycling, material selection and system innovation.

"The challenge is to have a durable, sustainable product that can last over years and years by selecting the good materials, having a low energy consumption as possible, getting the product back and reusing the components to make new parts." (Elfrink, interview)

This approach makes C2C a viable option in addressing the environmental impacts from the very first stages of the production process.

4.3.2 The road to C2C and main reasons for implementation

Information illustrated in Figure 3 is needed in order to establish the influence and main shifts that have marked the C2C adoption and its process within the company.
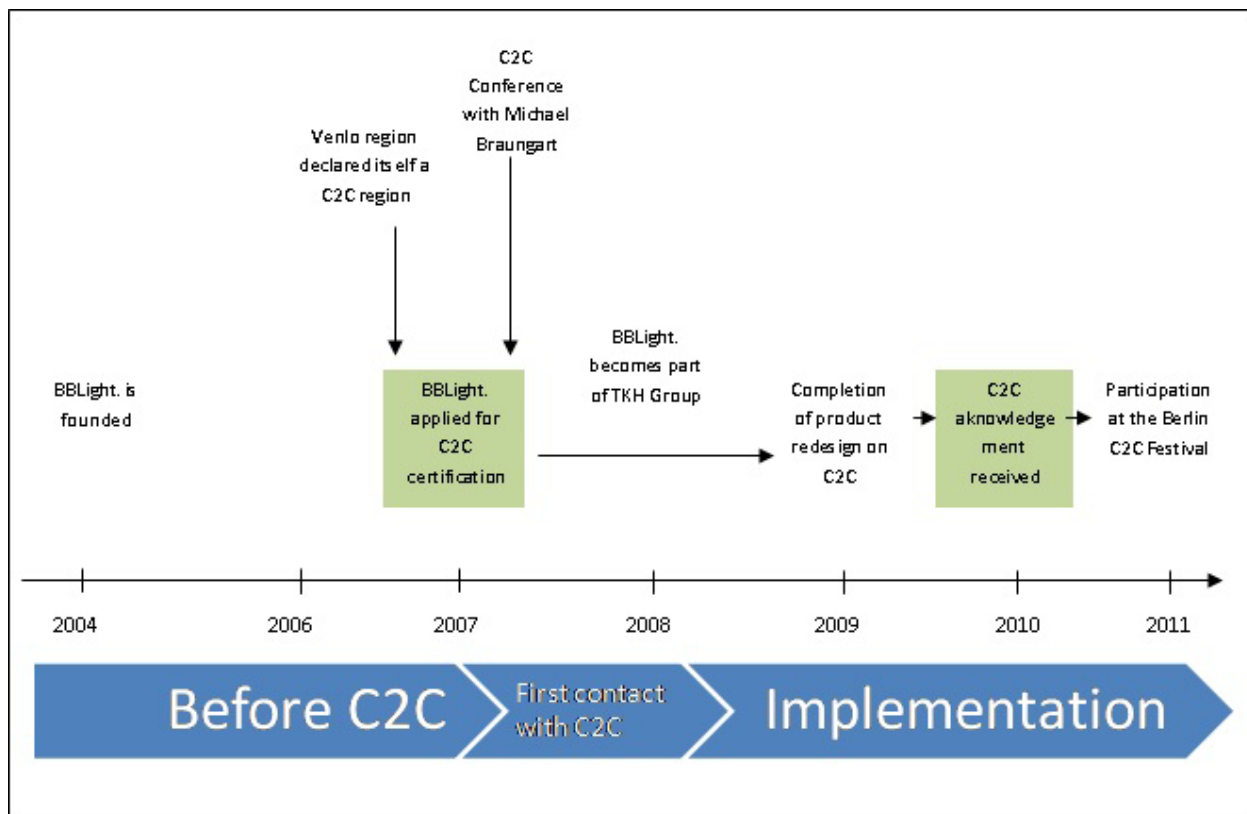
Figure 3: *Overview of History and Timeline of BBLightconcepts C2C implementation*

Before C2C

BBLightconcepts, a relatively new company, was founded in 2004 by Chekiel Bekker who recognized the LED potential for becoming an important lighting system. At first, because of slow developments in usage of LED in large areas, Chekiel Bekker decided to produce conventional lighting. Several years have passed and BBLightconcepts made constant innovations in safe implementation of LED light in hallow

tubes. In 2007, Chekiel Bekker's goal of producing LED lightpipes was realized and automated production started.

In 2007, BBLightconcepts was still under complete ownership of Chiel Bekker and moved production to the present site in Doetinchem. The focus was kept on surpassing the efficiency of conventional light systems and promoting the LED lightpipe.

> "In 2004 we started with conventional lights and since 2007 we are active in bringing the
> LED into the tubes and we started with the development of the electronics to be sure we
> can beat the light efficiency of conventional light products." (Bekker, interview)

First contact with C2C and reasons for implementation

The C2C concept was brought to BBLightconcepts direcly by its owner, Chiel Bekker, after he attended a conference led by Michael Braungart in November 2007. In December 2007 BBlightconcept applied for the C2C certification through the EPEA office in Eidenhoven, which in turn requested assistance from the main office in Hamburg.

The main identified reasons for BBLightconcepts to start a C2C process were the intensification of environmental legislation and increasing customer demand for sustainable products. CEO Chiel Bekker is confident that the focus of local governments, like the Venlo region in The Netherlands, on durable and sustainable products will increase the demand for sustainable and C2C products.

> "Local governments are more or less obliged, as of January 2012, to only buy durable,
> sustainable products. That is a very interesting market for us. We have the Venlo region
> in Holland which is aiming at being completely C2C organized within one year from
> now." (Bekker, interview)

The company regarded C2C to be the way of achieving a durable product that would meet future requirements from the main customers, while at the same time falling within legislation delimitations and avoiding charges on production.

> "C2C was the thing we were looking for at that time and which we could implement and
> use to let our customers know we are making sustainable and durable products according
> to a standard." (Elfrink, interview) "We really implemented C2C because that could, in

the future, help us not to be forced to pay pollution and recycling charges." (Bergström, interview)

Implementation and main challenges

A kick off meeting was set between the CEO Chiel Bekker, Bennie Elfrink, the head of the Research and Development Department, and representatives of EPEA Hamburg. The focus was set on implementing the first step: evaluating the product components and company suppliers. Identification of all problematic materials and a positive list of the product were done by EPEA in collaboration with the company and its suppliers. EPEA also established a product scenario regarding the end usage of the product and its component parts.

> "The nutrients in BBLightconcepts products are technical nutrients, so they are not intended to go into the soil. Right away that changes how you assess the components" (Skublak, EPEA, interview).

The complete and easy disassembly represents, for technical cycles, an important feature of the finished product. BBLightconcepts lightpipes would have to meet these features. Once the problems have been identified and new issues have been presented, BBLightconcepts internally selected ways of dealing with them and advancing in the C2C process.

> "They went beyond the first steps; they redesigned the product in order to solve the problems" (Skublak, EPEA, interview).

Over a period of two years, BBLightconcepts developed a new design of the product in order to exclude PVC, rubber and glue form the ingredient list. PVC and halogen were phased out of the product on the basis of health and environmental concerns. Rubber and glue were eliminated in order to make the product easy to disassemble into component parts and reintegrated into the technical cycle.

> "From C2C we learnt that we must not use PVC, therefore we use halogen free wires, we replaced bhromeium with another flame retardant that was not conflicting with C2C. We took out the rubber as you cannot make a new product out of rubber. It can only be shredded or turned into something different" (Elfrink, BBLightconcepts, interview).

C2C is now part of corporate communication to internal and external stakeholders and of employee daily activities. New contracts and services are closed with end clients as well as with nutrient managing

companies. Some issues still remain in the use of polycarbonate in the finished product which is not deemed acceptable according to the present state of C2C certification. As a result, BBLightconcepts received recognition from EPEA for their effort and implementation before a full certification can be issued.

This situation raised challenges in implementing C2C in production as well as in other company activities. A lack of clarity in the initial evaluation led to the change of polycarbonate from being initially accepted by EPEA to being listed as harmful and a component that needs to be eliminated. Phasing out of this component was not implemented due to unsuitable substitutes and certification could not be achieved. The whole process was in danger of being stopped by management.

> "Companies have to come up with a paper that they can use to mark the stages where they are. That is why we have received an acknowledgement, otherwise we would have stopped the whole procedure; you cannot be holier than the Pope" (Bekker, BBLightconcepts, interview).

A challenge faced by the EPEA in receiving information on product ingredients was the unwillingness of BBLightconcepts' suppliers to share detailed descriptions of their own products. The certification body is working on a version of the requirements that takes into account the complexity of the electronic products geared to solving such issues and enabling knowledge gathering.

A rather restricted market awareness of the C2C concept was also perceived as a challenge. In order to tackle this problem, BBLightconcepts includes in communication with its clients more information on what C2C means and how it affects the product. The need for planned market awareness of C2C was mentioned by all interviewees.

> "C2C is still not very well known in the common world. If you just tell people that the product is recyclable, they don't really care. We come with a presentation where we show them what we changed and what we did. You have to make people aware that you are a strong believer in the concept and you have to convince them why it is important" (Bekker, interview).

Collaboration with the certifying body EPEA is still active, though not at the level of first steps. Participation in C2C events and the creation of C2C cafes in partnership with other C2C Dutch companies in the region maintains BBLightconcepts' personnel in contact with C2C developments.

4.3.3 Identification of the C2C routines

Having established the context of C2C implementation and the main points and challenges in the process of changing production within C2C requirements, attention is now given to the specific routines BBLightconcepts exhibited. Based on the actions taken by employees at different times in the implementation period, these routines were grouped into five categories which will be discussed further and which will form the C2C routine bundle at BBLightconcepts.

Evaluation routine and information gathering

Among the patterns observed from data collection presented here are the ones related to evaluating and information gathering on product design, production process and possible business strategies. Since the process of C2C implementation starts off with a required listing of all ingredients in the product and a delimitation of a cycle in which the product is to be placed, evaluation activities are undertaken both by company employees and by the consulting body.

Personnel at BBLightconcepts provided detailed ingredient lists, information on energy and water usage both at own production facilities and at supplier locations to EPEA consultants. Once this was done, future actions would be based on the feedback received on problematic components.

> "We made a product scan as it was at the time when we started (the process n.r.)" (Elfrink, interview). "Suppliers received visits from EPEA to control the cooling water usage; the whole chain of suppliers has been checked" (Bekker, interview).

Evaluation of the present situation under the requirements of C2C provides information that is analyzed by employees using different criteria than before. The feedback received from EPEA and the creation of a passive list of ingredients and issues is interpreted according to instructions from the consultancy company.

Evaluation of activity does not stop at product level. Information is gathered on possible new contracts with nutrient companies, customers and intermediaries. Based on the context and cycle elaborated for the product, possible routes of action are taken into consideration for future implementation.

Operationalization Routine

Faced with new production criteria, designers and engineers at BBLigthconcepts proceed to explore the options best fitted to achieve the set objective. Once the decision was taken on finding solutions to the issues raised after this evaluation, actions were taken for product redesign.

Components that were marked dangerous and were advised for phasing out were eliminated from production where substitutes were found that would comply with C2C evaluation. Tests were conducted in order to establish the suitability of alternative materials in maintaining product quality and overall design. The passive ingredient list and the assessment of problematic materials is activated by taking PVC, halogen, rubber and glue out of the product and substituting them with alternatives from EPEA database or from the company's own developments.

> "We have completely changed the product line and made a new design and production.
> For example we now use halogen free wires" (Elfrink, interview).

Due to the lack of alternatives for polycarbonate that would maintain the durability of the product at the same level, the replacement of this component is opted out. The pressure here was the importance of keeping in line with product specifications.

> "We use polycarbonate that can be harmful to children when it is used in combination
> with food. We don't have an alternative to polycarbonate. We could use an acrylat , but
> then the tubes would break very easily as it has no impact resistance" (Elfrink, interview).

A special production machine is developed in collaboration with a sister company from the TKH Group. The machine requires different settings and operates on a different principle than the replaced model. Built specifically for realizing the goal of creating a C2C product, the engineers and designers of the machine take into account the specifications of the concept.

New contracts for services based on the specifications of the new product are signed with waste managers, energy companies and clients. The product's new features allow the nutrient company to disassemble and reuse all product components under an agreement with BBLightconcepts.

A leasing system is set up based on the newly created properties of the product. The rest value of the LED pipes is higher than in previous designs and the possibility of the product returning into production as separate parts is considered a commercial point.

> "C2C is more than the product. We have different kind of garbage bags, we gather the polycarbonate separately, paper, wood, we recycle waste materials" (Elfrink, interview).

Training routine

The actions taken by BBLightconcepts with regard to including its staff in the new C2C concept implementation can be summarized under a training routine. This does not refer merely to training sessions on C2C aspects, but also to the way in which employees react to C2C in their daily activities.

Being a small company of 28 employees, most of the employees working directly on C2C implementation were concentrated in production and design. The company manager is himself involved in the design of the product and the company sales division is transferred to the TKH Group.

New employees hired in the company are taught and informed on the recycling and waste separation actions by other, more experienced personnel. As this practice was introduced along with C2C designs in production, employees have come to consider waste recycling as a logical way of action.

> "The people that were here before think this makes sense and they tell the new employees
> that we do things this way, separating the materials, even plastic water bottles. They think
> it is very normal" (Elfrink, interview).

When designers and engineers consider a change in design of the product, the selected and operationalized C2C list is taken into account from the first drafts. Designers send the new development for approval and feedback from EPEA.

> "C2C is in from the very first day of creation of new fixtures. Whenever we develop
> something new, change something in our product, we always have to see if the changes
> we do are compatible with C2C" (Elrink, interview).

As the C2C implementation became operational and the first results in reducing production price, elimination of hazardous parts and increase in quality were observed, TKH Group took an interest in the concept. It has developed a job description and has hired a specialized person in investigating and assessing the possibility of replicating the C2C criteria among the other 74 companies and their products.

> "TKH Group have now hired one special full time employee who is looking at all the 74
> companies owned by TKH to change products and product situations to durable solutions
> and if possible, C2C" (Bekker, interview).

Communication routine

Closely linked to the training routine, the communication routine is composed of actions taken in order to spread the word among own personnel as well as outside stakeholders regarding C2C development and importance.

Due to the relative small size of the company, internal communication was easily accessible through direct channels. Employees from offices outside the Netherlands receive information on what C2C means, how it is implemented and what the main points of action are.

> "It is quite easy to say that we will go in this direction as we are a company with a couple
> of people" (Bekker, interview).

In terms of external communication, the C2C implementation process triggered partnerships with other companies in the region in organizing C2C events. The events, as mentioned previously in the case of one of the partners, Royal Mosa, target raising awareness of C2C among possible clients and connecting with new developments on the market.

When dealing directly with clients, detailed information on the C2C specifications and changes in production is given. Presentations do not only state the recyclability of the product, but go deeper in explaining the processes and the reliability of the concept.

Re-certification routine

BBLightconcepts does not hold a C2C certification on its product due to the presence of polycarbonate in the design of the lightpipes. The acknowledgement received from EPEA acts as a substitute for certification until one will be received. Resubmission of information on product, energy type and usage, and water management is done on a yearly basis.

> "The challenge with BBLightconcepts is that they want to go further, but getting the
> suppliers to give us information is very difficult. We are working on a new certification
> system to incorporate more complex products such as electronics" (Skublak, interview).

Regular meetings with the certification company representatives take place. BBLightconcepts attends C2C events both as a speaker and example, but also as a way to follow recent developments. The constant redesign and rebuilding is done through consultations with the positive list and EPEA feedback. This

monitoring and re-certification pattern provides a basis for further implementation of innovations discovered over time and during collaborations and partnerships.

> "We have regular meetings and they also introduce me to other companies who are applying for C2C certification. We are now working together with Arhend company, Desso and a nutrient management company" (Bekker, interview).

4.3.4 Summary

This case study describes the introduction and the development of the C2C concept in the LED company BBLightconcepts starting with the first contact and going on to the internal routines and tasks that have been affected and changed by C2C. Several routines have been identified in the data analysis process and have been classified according to their main impact on the implementation process.

Routine	Actions
1. Evaluation routine	Detailed list of ingredients provided to EPEA Information on water and energy supply is given to the certification body Feedback is received from EPEA (passive-positive list)
2. Operationalization routine	Substitutes were found to dangerous ingredients Polycarbonate was not eliminated from the product A special production machine is developed A leasing concept of products is set up
3. Training routine	Production and design departments are mostly involved New employees are taught on C2C principles Employees consult the C2C list permanently A new position was created at group level for identification of C2C developments
4. Communication routine	Direct communication is done internally External communication creates new partnerships on C2C Information on C2C is given to clients
5. Re-certification routine	Yearly submission of product and energy information to the certification body Regular meetings with EPEA personnel Monitoring of recent developments

4.4 Gabriel: the first Danish company opting for a C2C product

Gabriel A/S is a wholly owned subsidiary of the publicly listed company Gabriel Holding A/S and operates in the textiles sector. Production of furniture fabrics including the processes of dyeing and finishing is the principal activity. The head office is based in Aalborg, Denmark with production facilities in Lithuania and China and numbers 64 employees and 90 per cent of its production is exported (Gabriel A/S, website). Founded in 1851, Gabriel has a long history in the implementation of environmental and CSR certifications, labels and systems[4]. The company describes itself as a niche manufacturing firm of products and services for areas of use in which there are mandatory quality assurance and environmental management requirements (Gabriel A/S, website).

4.4.1 Environmental challenges

Water usage and pollution

The textile industry requires a great amount of chemicals and water usage. Over 2000 chemicals are used in the textile industry from dyes and transfer agents (Ecotextiles, website). Water pollution is a result of the use of water at every step in textile production in order to convey the chemicals and wash the fabric before each step commences. The textile industry is the greatest water polluter after agriculture worldwide (Ecotextiles, website). The high usage of water is also a concern to both textile manufacturers and environmental agencies.

Dyes and chemicals

One hazard that the textile industry has to address is the use of chemicals in dye stuffs. Dyes can contain heavy metals such as lead and mercury; the bleaching process uses chlorine. All these cause significant damage to surrounding environments and human and animal health.

Energy consumption, air quality following contact with emissions from burnt textiles, disposal of fabrics after use and recycling of waste at plant are also points to be taken into consideration when assessing the environmental impact of the textile industry (Nedergaard, interview). The fabric itself and its origin are also factors of impact. Cotton based fabrics may be produced from extensive cotton farming which lead to soil degradation. Polyester fabrics are currently used more frequently than cotton. Polyester can be reused and recycled, but it becomes a hazard once catalizing agents like antimony are used (Nedergaard, interview).

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[4] It holds the ISO 9001, 14001 certifications, The European Flower and Øko-tex labels, implements EMAS and is a member of the UN Global Compact

4.4.2 The road to C2C and main reasons for implementation

Figure 4 illustrates the main developments in Gabriel A/S history and steps that have marked the C2C adoption and its process within the company.
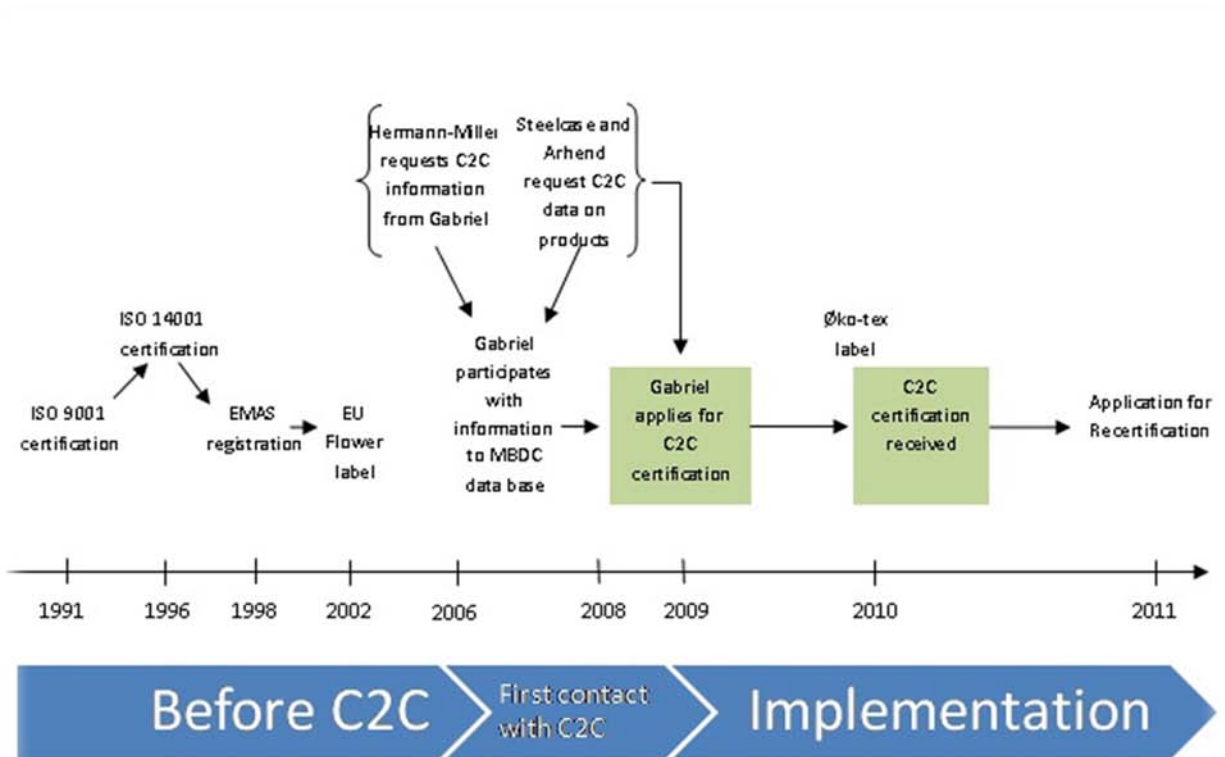
Figure 4: *Overview of History and Timeline of Gabriel A/S C2C implementation*

Before C2C

As mentioned earlier, Gabriel A/S has an extensive experience in adhering to environmental and CSR systems and certifications. Before applying for a C2C certification on its wool products, Gabriel A/S gained the ISO 9001 quality certification in 1991, followed by the 14001 environmental certification in 1996. The company was registered under the EU Eco-Management and Audit Scheme (EMAS) in 1998. Gabriel A/S was awarded the EU Flower label in 2002 and in 2010 introduced the Øko-Tex label on the main product, later extended to 67 per cent of fabrics produced.

First contact with C2C and reasons for implementation

The first contact with C2C was made by Gabriel A/S through requests from its clients. In 2006, during a project with US client Herman-Miller, the client requested access to ingredients used by Gabriel as well as access to product database. The task proved difficult to carry through due to lack of information on requested data.

Two years after the first request, another important client and global manufacturer of office chairs, Steelcase, asked Gabriel A/S about C2C products and for information and access to the data base. Dutch based Arhend company was next to request C2C certification from its textile supplier.

> "We had a project with Herman-Miller in the US and they are focused on the C2C concept and they started coming up with a lot of questions and they also liked us to give direct information in the data base. It was difficult to provide exactly what they needed because of lack of information. After a short time, Steelcase and Arhend also started to ask about it" (Nedergaard, interview).

Collaboration with clients continued by supplying them and MBDC with requested information and data for the next one year and a half. Due to the slow speed of the process, the Quality, Environment and Production department at Gabriel decided that having its own products C2C certified would increase the speed of collaboration and also meet customer demands.

> "We worked indirectly for one year and a half and we decided it would be faster if we went for the certification ourselves" (Nedergaard, interview).

According to EPEA, Gabriel A/S is a leading company in environmentally safe textiles and, apart from financial benefits as a result of certifying C2C products, the driver for implementation is also the desire to continue being in a leading position.

> "Companies like Gabriel have done all they can do to be responsible in this production paradigm. They start with C2C because they see it as the way to maintain the leadership position in the new paradigm. It is also something that makes sense to them and of course they should not do it if it is not profitable" (Fluri and Lyngsgaard, EPEA Copenhagen, interview).

Implementation and main challenges

Once the decision for certification was reached, direct collaboration with MBDC started. First meetings between the Quality department and MBDC representatives resulted in Gabriel A/S being in a head start position on product component requirements.

Having previous implementations of labels and environment management systems, eased the way to developing the tasks and meeting the requirements for C2C. Documentation of product information was one of the main steps.

> "Our wool products were already on a high level, so the step forward was more in relation to documenting that they are C2C products" (Nedergaard, interview)

Water cleaning and purifying was not changed as its evaluation was in accordance with C2C requirements. Energy usage at production sites remains an issue as there is no access to renewable energy sources at production locations.

> "We did not have to change water cleaning. It would have been different if we hadn't worked a lot with our environment strategy before, but we already had EMAS and ISO 14001" (Jensen, interview).

A list of ingredients for dye stuffs was established for all wool products. Gabriel did not implement the C2C criteria on all its products, but focused on wool products. Here the requirements for C2C were almost fulfilled during other certification and it did not require major production change.

During the process of implementation, tests were done to maintain the design and quality of the product while introducing the dyes to C2C criteria.

> "A lot of testing and documentation has been made. The most important step in the process was to make new chemicals and dyestuffs or get them and be sure that we could still produce the design at the same high performance" (Nedergaard, interview).

During the process, interest spread to the design department and more focus was put on the project by management and other employees in the organization were informed about C2C.

One challenge faced in the beginning was the slight difference in tasks' anticipation. It was discovered that while tasks were started out normally like any other, later on C2C evaluation would require considerably more effort.

"We listen to our customers and when C2C came up it was just a task like any other task and we just started. Later on we found out that it was a little bit bigger than what we assumed" (Nedergaard, interview).

Present again in this case, as with the others before, Gabriel A/S found the ambiguous criteria and internal MBDC chemical assessment to be one of the issues in the implementation procedure.

"It is a bit of a black box system. Some things are not really in our hands as they were evaluated internally by MBDC. You have to wait for their conclusion" (Nedergaard, interview).

"It is a bit difficult to find the exact criteria you have to take into account and I think they expected me to know more about it" (Jensen, interview).

Lack of market knowledge on C2C was also perceived by Gabriel as the Quality department manager believes that "there are few people in the world who know about it" (Nedergaard, interview).

4.4.3 Identification of the C2C routines

Looking at the implementation process before C2C certification and the development of C2C after the certificate is received, a series of routines have been identified. Repeated, continuous or temporary actions were grouped into five main C2C routines according to their focus.

Routine for evaluation and information gathering

When the Quality, Environmental and Production department at Gabriel considered the C2C certification, evaluation of product components was not a new concept. Previous labels and certifications had required some of the criteria under C2C. Differences started to appear and C2C evaluation criteria became apparent during the process of evaluation.

Data was gathered and supplied to MBDC both from own Gabriel's own databases and suppliers of dye stuffs. During initial talks, the main supplier refused to offer the access to required information and the process was continued with the second dye stuff supplier. The first supplier is still contracted on other C2C products. MBDC internal evaluation resulted in feedback to Gabriel on ingredients list and hazardous substances to be eliminated. Having taken previous similar actions eased the way for documentation on C2C criteria to be provided. Earlier standards received became a basis for starting the new evaluation.

Tests on antimony concentration are done at the request of the certifying body. Unclear testing criteria lead to a delay in implementation of product variation. Further tests on titanium continue.

> "You have to have specific criteria to know exactly what to do. I had a test done for the level of antimony in polyester which showed that we were below the limit. The test was not accepted by MBD, they wanted another kind of test and they could not specify what kind of test it should be. I have talked to several institutes to see what they could make and the test they sent from MBDC was not the one that was recommended by the institute. In the end MBDC decided to go with the institute's recommendation" (Jensen, interview).

Plans for future activities are made according to feedback received. With the product changed and fitted to C2C criteria, take back systems of polyester fabrics are evaluated with the involvement of main clients.

Documenting water and energy type and usage forms part of the evaluation of the production facilities and conditions. Plans for implementing water management and stewardship are developed. Safe working conditions are observed by MBDC personnel and recommendations are made on possible improvements.

Routine for operationalization

From its entire product range, Gabriel selected the wool products for the C2C certification process. The decision was taken due to the relative ease in attaining the necessary criteria and the prospect of maintaining operational processes largely unchanged. Earlier experiences with environmental standards lessened the way to having wool fabrics C2C certified. The Gaya product range is created containing only certified products and ingredients.

The company permanently uses in its production of textiles a list of statements, warnings and unacceptable chemicals and dye stuffs. This list is created and expanded during the C2C implementation to include the feedback from MBDC. Dye stuffs for the C2C range are changed according to C2C evaluation criteria.

New chemicals and dye stuffs are selected based on their capacity to create the product at the same quality standard and reproduce the same color as before. If the final product color is not deemed acceptable, that color will not made part of the C2C range. Here the quality and design of the product take preference over the C2C criteria.

"It has been difficult to reproduce the colors and also eliminating the risk that it was not perfect. If it was not the perfect result we said that this will not be reproduced as a C2C color" (Nedergaard, interview).

Because of product quality criteria, even if taken back, polyester fabrics will not be used in making new textiles, but included in the design and composition of noise absorbing screen walls fabricated by another department within Gabriel.

Training routine

The training routine encompasses the employee participation in the implementation of the C2C process and its continuity within the company.

C2C development in Gabriel is mainly undertaken by the Quality and Environment Production Department with personnel experienced in fabric manufacturing, labels and quality standards.

"We are responsible for all the product quality, not just systems, but the products themselves so we have to keep our training on level" (Nedergaard, interview).

Over the implementation of the C2C requirements, the Quality personnel come in contact and collaborate with the development and the design departments. The result of this collaboration leads to a rising interest in reproducing C2C and enlarging the C2C product range within these departments as well. The Quality department dissipates the information and knowledge of C2C criteria among the adjacent organizational groups.

"Our designers and development department are now really focused on how we could work more actively with C2C in the future; in a few months we will introduce one of our main products in a very big C2C color scale" (Nedergaard, interview).

"The development department is looking at a polyester fabric which should have a C2C certification, but we have a lot of polyester suppliers so we will not be able to do everything from the beginning" (Jensen, interview).

Although all employees went through a training seminar with C2C personnel and an information day was organized in order to let employees know about the new certification, a lot of them were not aware of the certification process and their involvement came after the certification was received.

"The whole organization has been given information about C2C and we also went through a training seminar with the C2C employees" (Nedergaard, interview).

"I don't think many of my colleagues realized what C2C was. They heard the name C2C, but didn't really know what it was until we finally had the certification and we made the announcement" (Jensen, interview).

Top management was involved through the acceptance of the new actions organized for and around C2C implementation. As it was a process focused in the Quality department that could fit in the department's budget, top management was informed, but did not assume an active role in driving the implementation. Søren Lyngsgaard, EPEA Copenhagen, considers this important in making C2C a company-wide process.

"Gabriel might stay with this one product for now as they want to find out what it is doing for them. This is what makes sense to them. It is all a process of learning. Sometimes it also depends on where the drive comes from in the company, if it is one department or the management and the whole board. Sometimes it is just one department in the whole company that is doing this" (Lynsgaard, EPEA Copenhagen).

Training of personnel at department level had to meet the acceptance of top management. As Kurt Nedergaard describes, higher management's role with regard to C2C routine was more of confirmation of actions, then of initiator of processes.

"We had to focus on the project in our management group and it is important to get the acceptance of top management on the actions we take" (Nedergaard, interview).

Communication routine

Closely linked to the actions of the training routines, the communication routine is formed of the channels and ways employees communicate about C2C internally and externally with their stakeholders.

"If they take this as something that they want to communicate, then it has a great potential. Once this reaches the marketing people they see the potential for development, but they need all the departments and CEO on board" (Lyngsgaard, EPEA Copenhagen, interview).

Presentations of C2C and its implementation criteria were held after certification was received. The organization was informed about the C2C general terms and the sales team was given data on the label

and its characteristics. More specific collaboration and knowledge transfer was done with design and development departments.

> "A lot of people came to me to ask details about what C2C was and we had some days when we showed power point presentations and told them about the work and the criteria" (Jensen, interview). "We also get attention from our shareholders and colleagues" (Nedergaard, interview).

Regarding external communication, clients are given information on C2C products and their advantages.

> "We go to our customers and start up the talk, given them an understanding of what is possible; by having the certification, our customers like to speak to us about it" (Nedergaard, interview).

Kurt Nedergaard, the head of the Quality department is invited to give talks and presentations at events with a sustainability focus or with a specified C2C agenda. The communication towards external stakeholders

Re-certification routine

Through the re-certification routine, Gabriel takes action in yearly C2C application. While information on new products and colors is submitted for evaluation, Gabriel finds certifying the polyester fabric of higher importance than advancing in certification from Silver to Gold on the already certified products. The focus here is set on developing the range of C2C products and on maintaining the already received certification on wool products. Constant monitoring of the market specifications and pressures leads to such decisions.

> "I have been screening the market and most places accept the Silver level. I am not working on getting the Gold certification because we get most targets with the Silver one. Having the polyester fabrics C2C will have much more impact on the environment" (Nedergaard, interview).

Close collaboration with MBDC, EPEA and other technological institutes like Dansk Teknologisk Institut is ongoing. Through this cooperation new business strategies are planned built on the experience gained with C2C implementation and development. Consultancy services on working with C2C textiles are planned for customers interested in collaborating with Gabriel on the C2C concept.

"One of the commitments of the certification is that you want to improve every year, if you can't then you should strive for 2 years depending on the product and how difficult it is" (Lyngsgaard, EPEA Copenhagen, interview).

This position is also shared by Gabriel's employees when they refer to future activities through the lens of a C2C approach. Through the process of re-certification new perspectives on the business approach come in sight.

"Our strategy is that over the next few years to start up offering consulting services directly. We know that there are situations when customers need the services, but maybe they are not interested in our fabric. There are a lot of opportunities, but it is important that we talk to people who know more about the systems" (Nedergaard, interview).

Searching for improvements and new options, while ensuring the development of already implemented steps and procedures is part of the C2C re-certification routine at Gabriel.

4.4.4 Summary

This case study describes the introduction and the development of the C2C concept in the textile manufacturer Gabriel A/S starting with the first contact and moving to identification of the internal routines affected and changed by C2C. These routines and their comprising processes have been briefly described below.

Routine	Actions
1. Evaluation routine	Quality department involved in evaluation of product ingredients Data depended on the acceptance of suppliers to give out information Feedback was received from MBDC Antimony tests were done Plans for future activities made
2. Operationalization routine	Wool products were selected for certification Current list of warnings was expanded to include MBDC requirements New dyestuffs are selected on the basis of quality
3. Training routine	Quality department collaborates with development and design departments All employees went through training seminars Information day organized Management was informed and approved C2C actions
4. Communication routine	Presentation of C2C to personnel Sales teams received data on the new label Employees enquired about C2C Clients are informed on C2C
5. Re-certification routine	Yearly submission on wool products data to the certification body Certification of polyester fabrics is prioritized Close collaboration with MBDC and EPEA New business plans built Constant search for improvements

This chapter presented data from the three case companies. Firstly, environmental concerns of each industry were briefly mentioned. Furthermore, a short history of the company and its recent developments was offered. Reasons for C2C implementation and first steps are also evidenced. In response to the first of the research question, C2C routines for each company were identified and explained. The next part of the thesis will build on these findings in order to identify the evolutionary process of the C2C routine bundle.

V.   The evolution of the C2C routine bundle

This chapter draws on the within-case analyses to advance the importance of identified routines in the evolution of the C2C development at company level. It proposes a different view of the Variation-Selection-Replication-Retention Model put forward by Zollo and Winter (2002) to include routines as factors of impact in the change and innovation of routine bundles. The study suggests that, due to their attributes and the mechanisms employed by companies towards a specific goal, routines can enable or restrict variation, selection, replication and retention of the operational practice they are part of.

5.1 Introduction

In this thesis, research was based on the assumption that companies need to use organizational routines in the process of implementing environmental strategies, routines which are themselves changed in the course of implementation.

By looking at the evolution of the C2C progresses through the variation-selection-replication-retention model, more insight is gained into what routines determine the retention and development of C2C at company level. During analysis of collected data, the C2C organizational practice appeared as a bundle of multiple organizational routines triggered upon process initiation. Certain routines were seen to lead to the evolution of the operational practice and have an effect on the evolutionary steps.

During the codification phase of interview data, periodical reference to the literature discussed in an earlier chapter was made. Through this process and by looking at the company routines from each of the case analysis, five routines were identified: Evaluation routine, operationalization routine, training routine, communication routine and re-certification routine. These routines are seen to influence the transformations of the routine bundle through the evolution cycle in the model put forward by Zollo and Winter (2002). They are manifested at different levels and at different times in the evolution cycle of the C2C routine bundle.

5.2 Routines as part of an organizational routine bundle

C2C has been shown to permeate a varied array of organizational routines due to the characteristics of the process and the former routines applied by organizations. These routines have been coupled under the term "C2C routine bundle".

The processes identified to be part of the C2C organizational process were structured in five main routines according to their resulted action:

1. Evaluation routine
2. Operationalization routine
3. Training routine
4. Communication routine
5. Re-certification routine

These routine categories are the result of the iteration process done during data analysis. They became the major lens of viewing the cases. The chapter will now generalize on these findings, giving a generic insight found across the cases.

1. Evaluation routines

Evaluation routines depict the actions taken to generate new and alternative information about, for example, the present production process. Through the nature of the C2C process, initial evaluation has been done by all studied companies. This action was undertaken both internally and by external evaluation bodies such as EPEA and MBDC. While one process, such as product composition in BBLightconcepts was evaluated and results were analyzed, triggers were sent for evaluation within other processes such as product assembly and take back systems. All three companies, during C2C implementation, have gone through a screening of their production which resulted in certain options to follow.

> "We got advice from EPEA and we had a look at other solutions or
> suggestions there were for our product, but we also had to do a lot ourselves.
> They have to approve of the solutions we come up with according to a check
> list of our product." (Bekker, interview, BBlightconcepts).

As part of the evaluation routines, Royal Mosa as well as the other two companies, asked their suppliers for information about their products. This information was then kept and analyzed by the consultant body.

> "The main job was to collect all information about our ingredients, not only
> from ourselves, but also from our suppliers. They had to do measurements as
> well because they did not know exactly what was in their products" (van der
> Weele, interview, Royal Mosa).

Apart from evaluation of product components, all companies evaluated the energy they used in production. Due to the industry specifications, Gabriel and Royal Mosa have also reviewed and analyzed their water consumption and waste water quality.

"We documented where the energy and water come from, how energy is made" (Jensen, interview, Gabriel).

"This year we are measuring where the big water consumption points are in the company" (van der Weele, interview, Royal Mosa).

Through the evaluation routines, a break from tradition in the old routines and processes is created. These variations are possible routes of action that the company may decide to keep or discard.

2. Operationalization routines

The C2C routine bundle exhibits in all companies what seems to be an operational component. While the evaluation feature is present in the routine bundle with the scope of examining new circumstances, the operationalization routines were found to have a role in engaging with the reached conclusions. These routines represent the activations of decisions taken during the process of evaluation. The operational routines are thus visible during the later phases of the implementation process. The three case companies, while differing in methods of their C2C application, have selected a course of action that was operationally viable and achievable for their own purpose.

For example, as a result of operationalization, BBLightconcepts redesigned the production machine in order to eliminate certain steps and materials from the production process. Although one other possibility raised during evaluation was the elimination of polycarbonate from the product, BBLightconcepts decided not to implement this operation in its production.

"We use polycarbonate which has some material that can be harmful to children when it is used in combination with food. These things come up when you redesign the product, but we do not have any alternative to polycarbonate. We can use an acrylat, but then the tubes have no impact resistance" (Elfrink, interview, BBLightconcepts).

Royal Mosa changed the composition of glazes and pigments to meet the evaluation results. Compositions that do not contain lead and acidulous substances were developed in collaboration with suppliers. However, not all variations were implemented at once. The high gas consumption was one of the results of evaluation of production. However, even though an improvement has been found, it will only be implemented and put into operation when renovations of installations are required.

"We have found out about an improvement that would reduce our gas consumption and we think it is interesting for us to reduce our need for gas. We will implement the new solutions next year or the year after that when we will anyway need to do some renovations to the installations" (van der Weele, interview, Royal Mosa).

One other result of operationalization routines at Gabriel is the creation of a C2C line of products. As Gabriel has produces both wool and polyester fabric, the changes in dye stuffs were done only on the wool products and only if the finished C2C product would have the same color as before.

"The customer can get a C2C version of an already existing color, but now we are bringing in new colors that did not exist before. When reproducing colors, if the result was not perfect, that would not be reproduced as C2C" (Nedergaard, interview, Gabriel).

3. Training routines

Training routines are represented by organizational actions targeted at company personnel. These routines include both actual training seminars with company employees and their daily activities concerning C2C.

All three case companies have run company-wide training sessions regarding the implementation of C2C and they were mentioned by all interview respondents. As a result of training routines, developers of glazes at Royal Mosa have taken upon themselves the task of creating lead free products and the director of production is engaged in finding energy efficient solutions.

"Our developers are challenged to try to use glazes without lead, whereas before, they would not have done it, or they would not have asked the suppliers if they have such products. Our director of production is involved himself in various initiatives" (van der Weele, interview, Royal Mosa).

Gabriel has done a training seminar with EPEA personnel. While at first only the quality and environmental protection department was interested in the creation of the C2C product, the design and development departments; employees have become involved in engaging with C2C in producing a new color scale for one of the main products.

"We have found out that this is a main interesting area both for the quality department, but also for our design department and development department are now focused on how we could work more actively on C2C, so we introduce one of our main products in a C2C color collection" (Nedergaard, interview, Gabriel).

In BBLightconcepts, employees consider C2C specifications from the very first phase of design and production and new employees are hired by the whole group to analyze and develop products as C2C.

"If we would create new products, C2C would be in from the first day. Whenever we develop something new, change something in our productwe always have to see if the changes we do are compatible with C2C" (Elfrink, interview, BBLightconcepts).

"TKH group have now hired one special full time employee who is looking at all the 74 working companies to change products and also product situations to durable solutions and C2C" (Bekker, interview, BBLightconcepts).

4. Communication routines

Communication routines refer to the actions employed by companies to inform both internal and external stakeholders of the C2C process and results. These routines have been noted in all three companies with a higher recurrence in Royal Mosa and BBLightconcepts. While Gabriel also exhibited routines targeted at communicating the C2C development to employees and customers, the communication routines were temporary or mainly targeted at external stakeholders. All companies have exhibited a need to explain to their clients what the C2C process is and what it means for the company and the product.

Royal Mosa and BBLightcencepts organize periodic C2C events together with other C2C companies in the region they are all active in. Architects and speakers are invited to present C2C or sustainability related information.

"We invite guest speakers who present about different aspects of C2C related to sustainability topics" (van der Weele, interview, Royal Mosa). "This will provide us with a very good network of people who are interested in a durable way of doing business" (Bekker, interview, BBLightconcepts).

Royal Mosa informs its employees on C2C developments through a permanent article on C2C present in every issue of the personnel magazine.

BBLightconcepts gives detailed information to its clients on the whole process and the changes made in the C2C process in order to avoid disbelief.

> "You have to make people aware that it is not something that you can do overnight and you have to be a strong believer of the concept and you have to convince them why it is important" (Elfrink, interview, BBLightconcepts).

As part of the communication routine, Gabriel has presented the C2C concept to its employees and it has informed the sales personnel about the new additional information to their products.

> "We had an information day when the sales department got the information from us on the criteria and the background. That had a lot of value because if they do not understand and know what C2C is then they will not tell the customer about it" (Jensen, interview, Gabriel).

6. Re-certification routines

The last routines that were identified to make the C2C routine bundle and give an important dynamic to the organizational practice are the re-certification routines. What is meant by these routines is the continued improvement and feedback on the present state of activity and the quest for new options for improving them in order to receive certification the following year. Companies have to resubmit to EPEA the information on their production aspects like product ingredient list and energy and water sources. All three companies have exhibited routines for re-certification once the C2C implementation developed and certification or recognition was achieved. This state of continuous appraisal of the present situation and continued contact with the certification organization lead to the development of the C2C routine bundle.

Royal Mosa has regular meetings with EPEA in order to establish the current situation and develop future progress. Through the 10 year development plan, the two companies, Royal Mosa and EPEA, are collaborating on concrete projects to activate. The company is also continuously looking for ways of integrating renewable energy resources into its production.

> "Each year we have to renew the certificate and this means we have to resubmit the ingredients to EPEA. They guide us in the process still today

and we have a meeting every six weeks and we discuss and work on the vision for the next 10 years, a kind of innovation road map" (van der Weele, interview, Royal Mosa).

Within Gabriel, routines are concentrated on developing certified polyester fabrics while sending information on the already existent C2C products for re-evaluation. Achieving a higher degree of certification has less importance then enlarging the range of products and actions that fall under C2C principles. Gabriel is also aware of new technological developments that could become available for implementations in the future.

"It gives much more environmental impact to introduce C2C polyester fabrics than to bring our wool fabrics to a higher level of certification and it is also important that we talk to people who know more about the systems and if you want to be a good partner than you have to working with the latest technologies, methods and concepts" (Nedergaard, interview, Gabriel).

BBLightconcepts is also following the new developments and product redesgn is ongoing. Regular meetings with EPEA still take place even after an acknowledgement was received, although at a lower rate than during initial implementation steps.

"We don't work daily with designers now, but we have to follow new developments. It is an ongoing issue" (Elfrink, interview, BBLightconcepts).

"We have regular meetings with EPEA and they introduce me to other companies who are applying for a C2C certification" (Bekker, interview, BBLightconcepts).

"With BBLightconcepts we are still in touch and they are involved in our activities, but when the new version of certification comes out, we reevaluate whether they can be certified" (Skublak, interview, EPEA).

5.3 The Routine Evolution Cycle revisited

In the section presented above, five main routines of the C2C routine bundle have been identified and explained. What the next section proposes is a representation of the evolution cycle adapted by Zollo and Winter (2002) with the inclusion of the replication phase. This given model will not be used to discuss the evolution of one single routine, but the transformations that a whole bundle or set of routines experiences

in time. The routines described and mentioned above will be applied to this model and the way each evolutionary step is influenced will be analyzed-

The four stages of the model have been explained previously and are here adapted to the research purpose. The C2C routine bundle is here described as evolving through a series of stages chained in a recursive cycle (Zollo, Winter 2002b).
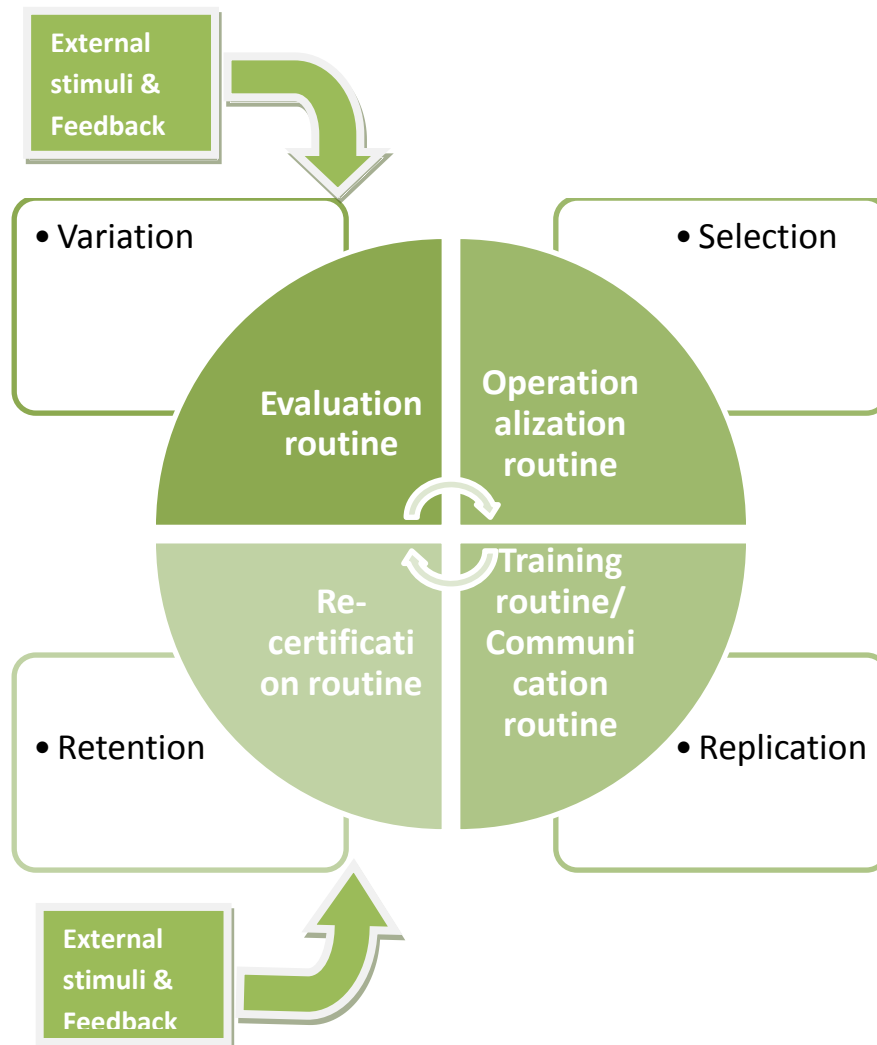
Figure 5: Routine bundle evolution cycle - Adaptation from Zollo and Winter (2002)

5.3.1 Variation in current routines

The first stage and the point of departure is the variation point in which new ideas and issues are being raised. This phase is a result of a combination of external stimuli with existing organizational routines.

External stimuli might come either from other internal process that were not previously related to C2C, such as the acquisition of new firms or a change of ownership, or the external environment (legislation change, customer demand, scientific discoveries).

Research in all three companies points to an elevated variation in the context of more developed evaluation routines of the C2C routine bundle.

> *Proposition 1a: The clarity of evaluation criteria leads to a higher likelihood*
> *of variation in existing routines and in the newly formed C2C routines.*

Here research shows that the evaluation routines trigger new insights into existent practices and creates new possibilities and ideas for implementation. Once the external stimuli or the internal quest for innovation surfaces, the existent routines are evaluated internally or with outside help from evaluation institutes to a certain C2C criteria.

One issue that has increased variation and created the possibility of change in existent routines was the criteria of evaluation. In product evaluation, the list of ingredients was taken through a series of criteria in order to establish a model of future options. The explicitness of the criteria has raised the possibility of variation from existing routines as employees themselves could search for new options. On the other hand, lack of clarity and difficulty in finding the evaluation criteria or inflexibility in evaluation triggers reduction in variation and a reduced incentive in evaluation routines.

"It was difficult for me to find the exact criteria to test the product on. It is a lot of ideologist talk that cannot be used in the certifying process. We had a test done on polyester which showed we are below the limit of antimony, but MDBC would initially not accept it. After many other tries they admitted the results of the first test" (Jensen, interview, Gabriel).

It is important to note that at the level of routines, sensing mechanisms as defined by Zollo, et al (2002) need to be more focused and clear in order for exploration to occur and variation to be successful.

"Maybe it would have been easier if the criteria for certification would have been a bit clearer. The feeling was like you were cycling up a hill and once you think you are there, you need to go a bit further because there is another hill in front" (van der Weele, interview, Royal Mosa).

> *Proposition 1b: The likelihood of variation increases if evaluation routines*
> *regard more aspects of the organizational practices at that point in time.*

Research also points out that the further the evaluation routines stretched in including more aspects of the organization, the higher the number of variations developed. In the case of the three companies, evaluations and feedback were made of their own products, but also on water and energy consumption, their suppliers' products and utilities consumption, technologies used and work environment. These have led to a rise in variation from the precedent situation and an increase in options to be considered in the implementation process.

While Gabriel A/S, the company with extensive experience in certifications, performed the evaluation routine with a certain ease in the beginning, characteristics of C2C principles proved to be more intricate and complex than previously expected.

Variation is thus linked to the characteristics of the evaluation routine that employees perform. These characteristics depend both on the evaluation criteria and on how far the search and sensing stretch to incorporate more aspects of firm activity.

5.3.2 Selection of newly generated ideas

The second stage in the evolution cycle is where the results of variation are selected and implemented considering prior experience and their impact on current organizational practices. In this phase of the evolutionary cycle of the C2C routine bundle, some of the types of variations are eliminated or stored for later consideration if the current technological or organizational situation does not permit their selection.

> *Proposition 2a: The likelihood of variation survival and operationalization increases if the access to the alternatives found is higher.*

As the evaluation routine of the current state of processes has led to the creation of many possible new routines or changes in old performances, a selection procedure will take into consideration for the next steps mainly those that present a higher availability at the moment of selection. In this process, selective operationalization routines will divide the practices that do get replicated from the ones that are left at the state of ideas.

The findings show that out of the production routines that were selected, the criteria that most have in common was the accessibility of their actual implementation. The findings in the Gabriel case showed that if usage of renewable sources of energy were not easily accessible at the time the selection occurred or if investment in such sources was not economically feasible, that variation in existing routines was not chosen to be implemented. On the other hand, the variations leading to new business concepts or changes in product design and composition that were deemed accessible at the moment of selection or in a short time, were chosen and went on to implementation in all three companies.

*Proposition 2b: The more changes in the quality of the final product are
required, the less likely the routines will be selected.*

All companies have shown a clear standing on the preservation or increase of the aspect, quality and features of their product. They have selected and implemented the variations brought by evaluation routines only if certain product features would remain intact or were at best more qualitative.

In one case, BBLightconceps did not include in its operation an alternative to polycarbonate as it would make the final product less impact resistant. Gabriel and Royal Mosa have selected the implementation of the alternative ingredients in their production only upon assurance that the quality and aspect would be kept.

"We have to make sure that we could still produce the design at the same high performance and if we could not have that, then we would not make that product C2C" (Nedergaaard, interview, Royal Mosa)

The implementation of new technologies in reduction of gas consumption will be done by Royal Mosa once the need for changes in current systems is present. Although the alternatives are present right away, the organizational changes their implementation will bring leads to a postponed operationalization.

Selection pressures or forces are thus both internal and external to the organizational activity. The characteristics of the operationalization routine are shaped by these pressures and, in turn affect the selection process of routines in the C2C routine bundle.

5.3.3 Replication of selected routines

Replication of the selected routines through company activities and mechanisms ensures the continuity and development of the C2C process and its component routines. Replication can manifest from organization to organization, but also within the same organization at different levels and departments.

*Proposition 3a: The more developed the training routine is the more likely
will C2C routines be replicated across the company.*

As the C2C routines evolve and knowledge is stored on their operation, the employees and human capital that are involved in their production replicate the routine and the attached knowledge over time. Findings show that once employees have been exposed to the new routines, they will proceed to replicating them as closely as possible to the original. In our cases, the more human capital was involved in the development of C2C routines, the higher the replication possibilities emerged. In the Gabriel case, C2C routines are replicated only by designers on a C2C project. In that division, replication occurred at a higher rate as quality requirements improved and eased the way of employees in doing so. Nonetheless, as there was

little human capital involved in the routine, restricted to the quality department, replication in other departments and by other employees was slow, if even present.

Continuously implementing C2C actions is dependent on the employees' interpretation and reproduction of the knowledge gained in previous steps. The information stored in their behavior and in physical artifacts they interact with is passed on to new personnel and to people employed in other departments.

In the cases where the training routines were more developed, replication developed faster and at a higher degree. C2C routines in Royal Mosa have been replicated by employees in diverse departments across the organization. In BBLightconcepts, employees from the TKH group that were included in the C2C routine bundle are asked to find ways of replicating them in other companies in the group. In all cases, training of personnel was seen as an important step in C2C routines. Training is taken to signify that a firm values its human capital and it made the C2C routines go beyond the passiveness in operation.

> _Proposition 3b_: _The more explicit and systematic the communication routines are, the higher the degree of C2C routine replication._

It has been showed in the case analysis that the communication component was an important part of the C2C routine bundle identified. By referring to the VSRR model, the highest influence the communication feature is seen to present is in the replication of C2C routines. Increased and continuous communication, both at internal levels and towards external constituents, has increased the likelihood of replication efforts by employees.

As Royal Mosa has shown, communication routines on explicit C2C matters are done systematically both towards employees and the board of directors at regular meetings. Gabriel employed internal communication routines temporarily and with a focus of informing personnel once the certification was received. This may suggest why replication of C2C has been done mainly on design and production levels.

Communication routines are intrinsically linked to training routines and they have both implications on C2C bundle replication.

5.3.4 Retention of the C2C routines

The fourth stage on the model is represented by the retention of the routines that have gone through the previous steps. Retention ensures survival of the routine bundle while also leading to a new prospect onto

which more variation can be applied. The importance of avoiding routine inertia through embeddedness in human behavior is of growing concern to researchers in organizational learning (Nonaka 1994).

> *Proposition 4a: Re-certification increases the likelihood of retention of the routine bundle.*

> *Proposition 4b: Re-certification is likely to trigger new variation through evaluation.*

Re-certification routines have been found to lead to the retention of C2C routine processes. Firm investment into these routines ensures the embeddedness of C2C practices and concepts while at the same time avoiding complete inertia of routines. Constantly re-examining their own implementation and status of C2C, companies in the study have shown a higher inclination towards awareness of new technologies and evaluation of new products.

Were it not for the resubmission of information and current state of production to the consultancy body, the C2C routines would slip from company attention and innovation would not be attempted. At the same time, the closer collaboration with EPEA even after the first certification process, the more increased the chances of company progress on the C2C routines.

"If there was no need for applying for certification every time and it would be a one time certificate then it would be only a piece of paper. What helps in keeping this is also the process and the fact that EPEA comes here every 6 weeks and we discuss progress and why not and what should we do" (Van der Weele, interview, Royal Mosa).

> *Proposition 4b: The likelihood of retention is moderated by the amount of external pressures.*

Another important retention force was found to be the external pressures in the form of customer request and policy regulation. Not only the actual and present pressures, but also the projected pressures were taken into account by all three case companies. The retention of the C2C routines will depend on the state of envisioned change in the external environment.

"We see that in Denmark, the Environment Ministry is having a lot of conferences around the country where we are asked to come around and tell the story and we know that some of the big players in our business are looking for C2C" (Nedergaard, interview, Gabriel).

"Resistance in the market was one of the main challenges as C2C is not yet widely known in the common world, but the need for these solutions will increase" (Bekker, interview, BBLightconcepts).

"I expect to have a lot of work to do because C2C is very known in countries like USA and Holland so the customers start requesting it" (Jensen, interview, Gabriel).

Retention of organizational routines and routine bundles has thus been found to be influenced not only by the presence of an embedded code or template that has been replicated over time (Zollo, Winter 2002b, Winter, Szulanski 2000), but also by the presence of re-certification mechanisms. These mechanisms form part of the re-certification routine that allows for a re-utilization of knowledge and the accumulation of more information. In this respect, retention can lead to more variation and avoid the danger of inertia in evolution.

Research also shows that retention of the C2C routine bundle is linked to the inputs from the external environment. This aspect has been accounted for in research on the evolution of routines when dealing with variations (Zollo, Winter 2002a, Nelson, Winter 2002). However, external pressures and the employees' awareness of such pressures have been found to also influence retention of the C2C routine bundle. In Miner et al study on organizational routines and learning, external pressures have been related to retention of certain routines. The findings in this thesis suggest that these pressures also impact retention on the group of routines that form the C2C routine bundle.

5.4 Contributions

This research has proposed a view of the C2C implementation process within organizations in order to establish what routines are used in the process and how they evolve. The implications of this study are thus two-fold.

Regarding the rather new **concept of C2C**, research in this study has placed the model into the dynamic environment of companies' internal organization and activity. While present literature provides an ample description of the steps and outcomes of the C2C model (Braungart, McDonough et al. 2007, Kumar, Putnam 2008, Rossi, Charon et al. 2006), a more detailed look at the way the concept is implemented was needed. Taking this view, this study uncovered the processes and actions taken within the three case companies in dealing with the proposed C2C steps for achieving the C2C certification or recognition. The organizational routines employed in the implementation phase have been identified and their development analyzed in order to uncover the main mechanisms that lead to their retention and continuity.

This research has thus expanded the literature body on C2C by including the main five routines that organizations have used and adapted to the new challenges and requirements.

Within **evolutionary theory**, this study has elaborated on the less utilized notion of routine bundles. For the purpose of this research, routine bundles have been identified as systems of routines (Nelson 1995)utilized in achieving a certain outcome. Findings suggest that companies employ multiple routines in dealing with overreaching aspects of their activity and in reaching a set goal. In contrast with studies focusing on one specific pre-determined routine (Vincenti 1990, Miner 1990), this thesis has firstly uncovered what the employees described as routines and secondly focused on generating the C2C routine bundle.

Furthermore, this study expanded the research on the evolutionary approach, not only by including routine bundles, but also by analyzing the evolution of the identified routine bundle through the four stages of the evolutionary cycle. Building on the model elaborated by Zollo and Winter (2002), findings suggest that routines and routine characteristics influence the variation, selection, replication and retention of the entire C2C routine bundle. Routine evolution and change has been linked to employee action and to knowledge creation and transfer (Feldman, Pentland 2003, Zollo, Winter 2002b, Winter, Szulanski 2000). Findings in this research suggest that the evolution of the entire routine bundle is dependent on its component routines and their attached characteristics, thus expanding the evolutionary view.

This chapter offered an analysis of the data gathered in the research process. Firstly, generic insights into the routines uncovered across the three cases were provided. Based on these findings, the evolutionary cycle was adapted in order to present the evolution of the entire routine bundle. The findings of the research are summed in the four main propositions and their respective sub-propositions. The chapter concludes with the presentation of main contributions to both the C2C research as well as to the evolutionary framework.

VI. Conclusion and further perspectives

6.1 Conclusion

The purpose of this thesis was to study how environmental principles and strategies are implemented within company practices and how the routines utilized in this implementation evolve through organizational processes. The C2C approach in dealing with environmental aspects of production and company activity provided an innovative and interesting perspective, using information and knowledge gathered under organizational routines **(chapter 1)**. The conceptual framework set the context and main focus of the thesis, bringing together the concept of C2C with the dynamic field of evolutionary theory and organizational routines **(chapter 2)**. Through an inductive theory building methodology **(chapter 3)**, this research used a multiple case analysis of three case companies. The cases were selected to reflect the implementation of the C2C principles and model within the dynamic internal company environment **(chapter 4)**. The analysis of gathered data **(chapter 5)** aimed at answering three research questions:

Q1: What are the organizational routines used in the Cradle to Cradle implementation?

Regarding the implementation of C2C within case companies, the analysis of data gathered on case companies **(chapter 4)** and a cross-case view presented **in section 5.2** of this research found five main organizational routines. Representing the processes and actions uncovered at different times of implementation and across different departments of the company, data revealed routines for evaluation, operationalization, training, communication and re-certification.

These routines have been identified through constant iterations among cases as well as routine theory perspectives. Actions and processes at company level have been grouped according to their outcome and proposed goals. The five main routines form the C2C routine bundle, incorporating all endeavors relating to or resulting from C2C principles implementation.

The evaluation routine presents the actions pertaining to information gathering and search for improvements on the current product, facilities and company environment. Operationalization routine includes processes dealing with changes in production and creation of new business model, while other options have been discarded. Training and communication routines comprise of employee development and dissipation of information on new practices across and outside the company. Within the re-certification routine, research included continuous evaluation of outcomes with the purpose of further improvement, as well as forces that contribute to C2C embeddedness into company practices.

Q2: How does the routine bundle evolve in the organizational setting?

Having identified the main routines that make up the C2C routine bundle, **section 5.3** of this study examines the evolutionary cycle this bundle undergoes. Research found that, through their characteristics, the five identified routines influence the evolutionary process the whole bundle. This finding led to the formulation of the four main propositions and their sub-propositions explaining the role of each routine in the four step cycle of bundle evolution.

Research in all three companies points to an elevated variation in the context of a more developed evaluation routines of the C2C routine bundle. Selection of identified variations is linked to the degree of operationalization in terms of changes required and accessibility of alternatives. The training routine and communication routine impact the replication step of the evolutionary cycle with their capacity to spread information to internal and external company stakeholders. Research found that retention of the routine bundle is correlated to the presence and increase attention to the re-certification routine. Also, external pressures have been found to impact retention of the routine bundle and the information it carries.

Q3: Under what conditions are the routines retained?

Special attention has been given to the conditions under which the routines and the routine bundle are retained within the organizational environment. The three sub-propositions presented in **section 5.3.4** describe the correlations between the re-certification routine and the presence of external pressures on retention of the routine bundle and the composing routines.

The presence of the re-certification routine increased the retention of previously developed routines. The periodical re-evaluation and monitoring of company activities ensured a constant presence of C2C considerations within both established and new processes. Through the re-certification routine, the danger of inertia in routines was thus avoided and the possibility of new variation and innovation is created. Data analysis has also shown that retention of the routine bundle is related to external pressures in the form of client demand, institutional and policy regulations present both at the time of implementation and also expected in the coming future.

Through the identification of the organizational routines used in C2C implementation and the analysis of their evolution through a routine bundle, this research has contributed to the developing body of literature on the C2C model seen from within the company environment, as well as to the evolutionary perspective on organizational routines. **Section 5.4** has given a more detailed view of the contributions to the C2C approach and the evolutionary strand.

6.2 Further perspectives

Over the course of this research, new perspectives emerged that could provide an interesting ground for further studies; this section will briefly mention these identified perspectives.

6.2.1 An inside view of the shift in environmental models

The distinction between eco-efficient and eco-effective view on environmental aspects of production attracts more attention from the corporate world with models like C2C entering a various array of companies. This new development presents opportunities of research that are currently still to be explored. Some past studies on environmental standards and measures (include citations on ISO studies) have looked at transformations the organizations are experiencing. The new models and their future adopters would also benefit from this approach taken at the micro level of the firm. The developments would also provide the opportunity of observing the transformations while they are taking place. Large size companies such as A.P.Møller Mærsk and Philips are currently undertaking such endeavors[5].

Comparative research into differences and challenges in implementation of eco-effective models in companies from various industries and of various size and market share would provide interesting insight for researchers in organizational studies as well as for industry practitioners.

6.2.2 Expanding the view on the evolutionary cycle

While this thesis has focused on the identification of organizational routine bundles dealing with environmental models and of their evolutionary steps, other company strategies may be viewed from the same angle. New challenges from the external and internal corporate settings give rise to strategies that may involve inter-departmental collaboration. Data from all case companies suggests that this cooperation leads to a mix of practices and routines aimed at achieving the set goal. Observing the way these routines and the bundle they form evolve may lead to uncovering the influence this process has on the overall strategy.

Whilst this study does not elaborate on these insights in more detail, they can prove to lead to interesting perspectives for future research.

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[5] For more information, the interested reader may consult the company websites.

VII. Appendices

Appendix A – List of interviewees

Organization	Name	Position
BBLightconcepts	Chiel Bekker Timo Bergström Bennie Elfrink	Company founder and manager Manager Nordic Head of research and development
COWI A/S	Jasper Steinhausen	Sustainable Business Developer Cradle to Cradle Certified Consultant
EPEA Copenhagen	Martin Fluri Søren Lyngsgaard	Director Director and Business Development
EPEA Hamburg	Christian Skublak	Environmental Scientist
Gabriel A/S	Kurt Nedergaard Annette Jensen	Manager of Production, Quality and environmental assurance Educated dye master and dye stuff engineer
Royal Mosa	Dorien van der Weele	Sustainability Manager

Appendix B – Glossary of terms and definitions

Biological nutrient - A raw material used by living organisms or cells to carry on life processes such as growth, cell division, synthesis of carbohydrates and other complex functions. Biological nutrients are usually carbon-based compounds.

C2C – Cradle to Cradle

Downcycling - The practice of recycling a material in such a way that much of its inherent value is lost (e.g. recycling plastic into park benches).

Eco-effectiveness - The term eco-effective is generally used in its relation to the term eco-efficiency. Whereas eco-effective is defined as: Meet our own goals while others prosper and eco-efficiency as: minimising our impact and taking the shortest route to our ends. Even shorter it is stated that effectiveness means "doing the right things" while efficiency means 'doing the things right'.

Eco-efficiency - The World Business Council for Sustainable Development (WBCSD) defined eco-efficient companies as those which create ever more useful products and services – in other words, which add more value – while continuously reducing their consumption of resources and their pollution. Eco-efficiency describes a vision for the production of economically valuable goods and services while reducing the ecological impacts of production. In other words eco-efficiency means producing more with less.

EPEA - Environmental Protection Encouragement Agency

MBDC - McDonough Braungart Design Chemistry

Technical nutrient - A material of human artifice designed to circulate within industrial lifecycles--forever.

Upcycling - The practice of recycling material in such a way that it maintains and/or accrues value over time (the opposite of downcycling).

WBCSD - World Business Council for Sustainable Development

Appendix C – C2C Nutrient Cycles

Representation of the biological and technical metabolism depending on the type of the product in use (source: EPEA).

Appendix D - Overview of C2C certification levels and criteria

Source: www.mbdc.com (last accessed 01.04.2012)

Platinum

- Actively recovering products and closing the loop
- Material Reutilization score >=80
- Use renewable energy for 100% of manufacturing (final assembly) and 50% of supply chain manufacturing
- Implemented innovative measures to improve water conservation and water quality
- Complete a third party social responsibility certification

Gold

- NO problematic chemicals (assessed by MBDC as RED) in product
- Plan for product recovery and closing the loop
- Material Reutilization score >=65
- Use renewable energy for 50% of manufacturing (final assembly)
- Complete an audit to characterize and quantify water use
- Complete an audit of corporate social responsibility practices

Silver

- Halogenated hydrocarbon content <100ppm
- Toxic heavy metal content (Pb, Hg, Cd, Cr+6)< 100ppm
- Material Reutilization score >=50
- Quantify the energy required for manufacturing (final assembly)
- Characterize energy sources and develop strategy for including renewable energy
- Adopt company wide water stewardship principles or guidelines

Basic

- All chemicals in product identified down to 100ppm level (0.01%)
- No PVC, chloroprene, or related chemical at any concentration
- All materials and chemicals assessed for toxicity to human and environmental health
- Strategy developed to optimize all remaining problematic chemicals
- All materials defined as technical nutrients to be recycled or biological nutrients to be composted

Appendix E - Detailed list of C2C certification criteria.
Source: MBDC

△MBDC

CRADLE TO CRADLE CERTIFICATION CM CRITERIA	Basic	Silver	Gold	Platinum
1.0 Materials				
All material ingredients identified (down to the 100 ppm level)	•	•	•	•
Defined as biological or technical nutrient	•	•	•	•
All materials assessed based on their intended use and impact on Human/Environmental Health according to the following criteria: **Human Health**: Carcinogenicity, Endocrine Disruption, Mutagenicity, Reproductive Toxicity, Teratogenicity, Acute Toxicity, Chronic Toxicity, Irritation, Sensitization **Environmental Health**: Fish Toxicity, Algae Toxicity, Daphnia Toxicity, Persistence/Biodegradation, Bioaccumulation, Ozone Depletion/Climatic Relevance **Material Class Criteria**: Content of Organohalogens, Content of Heavy Metals	•	•	•	•
Strategy developed to optimize all remaining problematic ingredients/materials	•	•		
Product formulation optimized (i.e., all problematic inputs replaced/phased out)			•	•
No wood sourced from endangered forests			•	•
Meets Cradle to Cradle emission standards			•	•
All wood is FSC certified				•
Contains at least 50% GREEN assessed components by weight				•
2.0 Material Reutilization/Design for Environment				
Defined the appropriate cycle (i.e., Technical or Biological) for the product and developing a plan for product recovery and reutilization	•	•	•	•
Well defined plan (including scope and budget) for developing the logistics and recovery systems for this class of product			•	•
Recovering, remanufacturing or recycling the product into new product of equal or higher value				•
Product has been designed/manufactured for the technical or biological cycle and has a nutrient (re)utilization score >= 50		•	•	•
Product has been designed/manufactured for the technical or biological cycle and has a nutrient (re)utilization score >= 65			•	•
Product has been designed/manufactured for the technical or biological cycle and has a nutrient (re)utilization score >= 80				•
3.0 Energy				
Characterized energy use and source(s) for product manufacture/assembly	•	•	•	•
Developed strategy for using current solar income for product manufacture/assembly		•	•	•
Using 50% renewable energy for the manufacturing steps			•	•
Using 50% renewable energy for entire product (including suppliers) and using 100% renewable energy for the manufacturing steps				•
4.0 Water				
Created or adopted water stewardship principles/guidelines		•	•	•
Characterized water flows associated with product manufacture			•	•
Implemented water conservation measures				•
Implemented innovative measures to improve quality of water discharges				•
5.0 Social Responsibility				
Publicly available corporate ethics and fair labor statement(s), adopted across entire company		•	•	•
Identified third party assessment system and begun to collect data for that, **training** for the employees			•	•
Acceptable third party social responsibility assessment, accreditation, or certification for all manufacterers and adoption of social statements for the suppliers				•

Appendix F – Interview Guide

Interview guide (adapted to each company and industry)

PART A:

Could you tell me your current position within the company?

What positions have you previously worked in?

Could you tell me a few facts about the industry and the place of the company within the industry?

How has the company evolved until now?

What are the major sustainability challenges within the industry?

How has the company addressed those issues so far?

When (specific date) and how has the company first come in contact with C2C?

Who were the persons who brought the concept to the company management/ownership attention?

What does C2C mean for you and for the company?

PART B:

What were the main reasons for deciding on implementing C2C?

What were the first steps taken and who was the deciding person?

How did the implementation develop throughout the company?

What major changes took place in the organization?

How did you attack or tackle the C2C requirements?

How was the positive list developed?

What do you do with the list and how do people use it?

What were the most notable challenges and how were they overcome?

What were the direct results and effects of the C2C implementation?

What indirect results did the implementation have?

PART C:

How can C2C be developed in the future in the company?

What new resources did C2C bring to the company and how will you maintain them?

How can they be developed in the future?

Would a platform of interlinked suppliers, producers and consumers help in further development of C2C in your company?

How would you participate in that platform?

How would you think the company would have evolved without the C2C implementation?

What is your perspective of the future of C2C in the company?

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