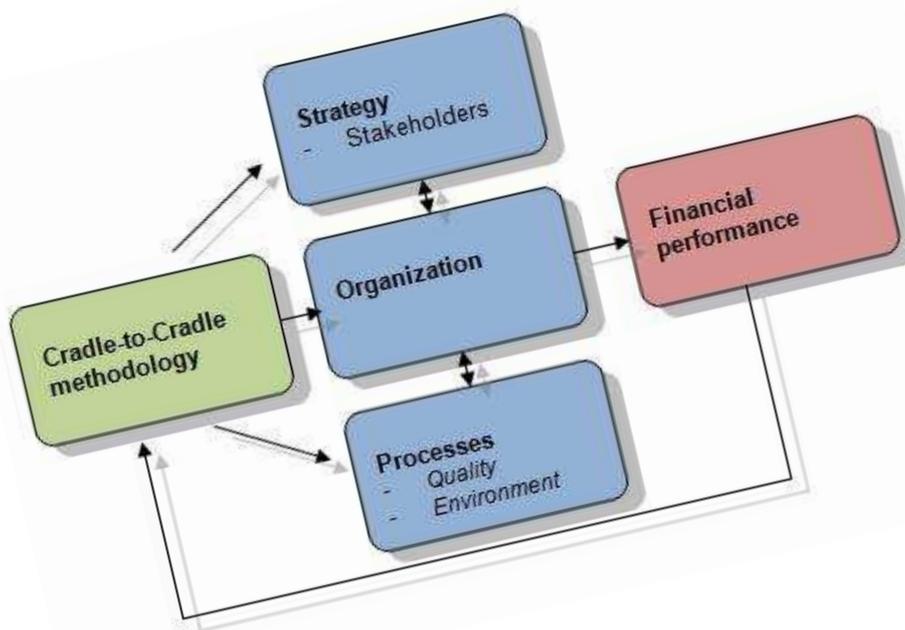


How does the cradle-to-cradle methodology contribute to the company's for-profit goals?

An explorative study on the financial consequences of cradle-to-cradle



David Zwaans

Management studies

Wageningen UR

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Student

David Zwaans
dzwaans@yahoo.com
Reg.nr.: 830127-994-020

Thesis MME - management studies

MST-80430
30 ECTS

Wageningen UR

Chair group Management studies
Hollandseweg 1
6706 KN Wageningen

1st Scientific advisor

Dr. Mr. H.J. Bremmers

2nd Scientific advisor

Prof. Dr. S.W.F. Omta

Preface

This thesis is conducted as part of my study MME, Master of Management, Economics and Consumer studies, specialization management. In my BSc I had a lot of courses concerning CSR, although this was merely focused on ethics, HRM and the social consequences of business.

When I started my MSc. in Wageningen, I was confronted with the impact of business on the environment. I did not immediately want to get involved with this topic, because of the somewhat strange image of those environmental concerned people, with strange and sometimes unrealistic ideas about the actions companies should take to decrease their impact on the environment. While I followed a course about environmental management, I heard about cradle-to-cradle. I read the book of McDonough and Braungart, watched the '*Tegenlicht*'-documentary about cradle-to-cradle and realized the potential of a concept that combined environmental and financial goals. Off course I was skeptic about the way how it worked in practice, but it was the best alternative I had heard of so far, so I started my thesis investigating how cradle-to-cradle contributes to the companies' financial goals.

I found that there was almost no data available, and there are not very much examples of cradle-to-cradle in practice, so my research became explorative. The main focus was on literature, which was extended with some interviews. It has been quite a long process, and not always easy, but I learned a lot from it.

I want to thank my supervisors at the chair group management studies, Harry Bremmers and Onno Omta, for their feedback, suggestions and patience. I want to thank the respondents from the interviewed companies for their time and their interesting information. I also want to thank SenterNovem for giving me the opportunity to visit the NUTEC-fair, where I met many cradle-to-cradle experts, saw different cradle-to-cradle initiatives and followed interesting seminars about cradle-to-cradle.

Abstract

This thesis aims to gain insight in the relationship between the cradle-to-cradle concept, financial performance and firm characteristics such as business strategy, organizational structure and stakeholders. This is done by an extensive literature research and interviews with companies that have experience with cradle-to-cradle. The interviews serve as explorative research, they provide additional information to the literature study.

Cradle-to-cradle is a relatively new concept, aiming at the elimination of waste, by designing products and production processes in such a way that all materials used in production can be recycled, without loss of quality, in either a biological or technological life-cycle. The cradle-to-cradle concept claims to focus on environmental, financial and social goals.

The theory of Miles and Snow is used to classify the strategy of the organization; Mintzberg is used for the structure of the organization. The main distinction that is made is between firms with a 'defender'-type strategy, often found in machine bureaucracies, who will focus on cost-savings, and firms with a 'prospector'-type of strategy and organic structure, which will focus on differentiation and revenues through an improved image.

The interviews give an impression of the way in which cradle-to-cradle is adopted in companies in the Netherlands. There is no data available about the financial consequences of cradle-to-cradle yet, but with use of the literature study and prior research on the relation between existing environmental care systems and financial performance it is concluded that cradle-to-cradle can have a positive influence on the firm's financial performance, both via cost-savings and increased revenues because of the firm's image.

Cradle-to-cradle can assist in both cost-savings and differentiation, although the success of implementation is dependent on multiple aspects, such as organizational structure and strategy. A firm with a prospector-strategy, an organic structure and an dynamic, innovative and flexible characterization will be more likely to adopt the cradle-to-cradle concept, and will be more likely to benefit from early-adopter advantages.

Keywords: cradle-to-cradle, environmental management, strategy, financial performance

Management summary

Last decades there is more and more attention for the influence of industry on the natural environment. More and more companies implement environmental management systems. Within the environmental studies there are developed many different theories on environmental management and environmental measures. This research is focused on cradle-to-cradle (C2C). C2C claims to focus on environmental, financial and social goals. Especially the financial aspect of C2C is investigated in this thesis. The main research question asks: *To what extent does the cradle-to-cradle methodology contribute to the for-profit goals of companies?* The main research question is followed by a set of research-questions that divide the problem in smaller parts, according to the theoretical framework, which can be seen in figure 1.

The first phase of this explorative research is the literature study. By studying literature on all the five elements of the theoretical framework the research-questions can be answered. To get more information about C2C in practice, interviews were conducted with environmental managers and CEO's of 15 companies with experience in C2C¹. Four small, six middle-sized and five large companies from different sectors were interviewed. These companies serve as practical cases that can contribute to the answers that are found in the literature study. Because of the very early stage of C2C in the Netherlands, the interviews are explorative.

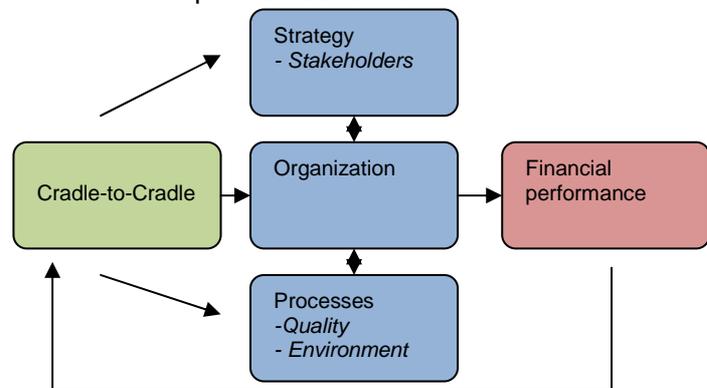


Figure 1 - Research model

Cradle-to-cradle

The first research questions are related to C2C. The first question asked: *What is cradle-to-cradle?* C2C is a concept that aims to eliminate waste, by recycling all materials without losing quality. To achieve this, products need to be (re-)designed in such a way that all materials can easily be disassembled and returned in their biological or technological lifecycle. Also the production-processes need to be redesigned, to improve efficiency, save water and energy and avoid pollution. The five main elements of C2C are the materials that are used, recycling, water-usage, energy-usage and social responsibility. The interviewed companies stated on average that they worked according the C2C principles, especially on the areas 'materials', 'social policy' and 'energy', and a little less on 'water' and 'recycling'. In box 1 some examples are given of C2C activities in the interviewed companies.

The second question asked *How is C2C related to existing environmental management systems?* When comparing C2C with existing environmental care systems, especially the environmental care systems aimed at pollution prevention and life cycle management have much in common with C2C. The main difference is that C2C is something that manifests itself in all parts of the business-process and on all managerial levels, and also focuses on social and financial improvements.

The third question related to C2C asked *What are the motives for C2C?* The main motives for adopting C2C are found in the environmental, financial and social areas. Adopting C2C leads to better environmental performance, so companies striving for lowering the environmental burden of their organization might use this as a reason to adopt C2C. Also from a social view C2C leads to better relations with the employees and the local stakeholders. This might be a reason for companies who want to be leading in for example CSR. The financial motives are however the most important, because C2C can result in cost-savings, due to improved efficiency and reusing (raw) materials, but also to an increased "green" image of the firm.

¹ The companies were selected based on their participation in the C2C network, via the Dutch chamber of commerce, via SenterNovem and via the Nutec-fair.

Box 1 - C2C activities in participating companies

All the interviewed companies are in some way involved with C2C, varying from a company in an early orienting phase, to a company that started 15 years ago with C2C materials and which best sold article world-wide is officially C2C certified. To give an impression of the different stages in which the respondents are, for each of these groups a quote is given:

Phase of C2C activities in interviewed companies

Firm	Phase	Quotes
4	Orienting	"Together with some students we are doing a project to analyze to what extent we can do something with C2C."
5	Certifying	"We are trying to get C2C certification for one of the products we sell, a compostable coffee-cup. The final target is to have a complete assortment of C2C certified packaging and disposables."
12	Certified	"All our products are developed according to the C2C principles. The top management supports it and it is present 'in the DNA' of our company. We cooperate a lot with other companies in the chain."

On average, the 15 companies scored a 5.04 on a 7-point scale for C2C, which is a positive result. The 15 companies scores especially on the use of materials, energy and social policy.

Strategy

The second part of the sub-questions is related to strategy and stakeholders. The first research-question asked: *How does C2C fit in existing theories about strategy?* Strategy is explained using the distinction between prospectors and defenders from Miles and Snow. C2C often requires a redesign of the product and the production processes, which seems to be more suitable for prospectors. Also the resources and capabilities needed for C2C should be flexible, innovative and technically high-developed. On the other hand does C2C contribute to efficiency, so the defenders, who are risk-avoiding and more focused on cost-savings, might be willing to adopt C2C as well, although in a later stage.

Box 2 - Stakeholders and chain management

Some of the interviewed firms gave examples of how they cooperate with their stakeholders. In this thesis this is seen as part of the strategic level of the firm; the level where the external relations are managed.

Stakeholder orientation because of C2C activities in interviewed companies

Firm	Quotes
1	We have taken different actions in social responsiveness, for example by volunteer projects like cleaning up a centre for homeless people
2	We are closing the product cycle in cooperation with our stakeholders. We have extensive discussions with the province and our suppliers, but we also want our customers to cooperate, so we can realize a closed products life cycle. C2C contributes to more stable chains We redesign our C2C supply chain.
9	We source 85% of our natural raw materials from local distributors.
10	We work together with our stakeholders to implement eco-effective products.
11	We cooperate with 4 other companies to find solutions for the environmental problems in our sector, such as the toxic elements in paint. Together it was possible to find a producer that is developing C2C paint.
12	We cooperate a lot with other firms in the chain, both horizontal and vertical.
15	At this moment we are involved in a project where we use the knowledge of different firms to develop a C2C energy-plant.

The relation with stakeholders due to C2C activities is an important element of C2C. The mean score on the social activities of C2C is 5.93 on a 7-point scale, which is quite high.

The second research-question is focused on stakeholders, and asks: *How does strategy align stakeholders and organization?* Strategy aligns the stakeholders and the organizations by translating the stakeholders' wishes to the organizational characteristics, taking into account its resources and capabilities. The alignment of strategy with the other organizational levels and with the (local) environment is of great importance for the company. C2C assists in aligning strategy and stakeholder wishes because of its focus on the different groups of stakeholders interests. In box 2 some quotes are given from the interviewed companies about the influence of C2C on their stakeholder management.

The third research-question asks: *What is the role of stakeholders in the environmental awareness of companies?* Literature shows that stakeholders influence the environmental awareness of companies. Especially government and shareholders have a big influence. The fourth research-question in this part asks *What contribution does C2C make towards stakeholder goals?* C2C focus on three areas of stakeholder interests; environmental, financial and social. In box 2 quotes from the interviews about stakeholders are given.

Organization

The first question related to the organization asked: *How can organizations be characterized?* In this thesis the theory from Mintzberg is used to analyze the structuring of organizations. Mintzberg defines five configurations, each with its own characteristics. This is used to answer the second question in this area as well; *What characteristics are stimulating cradle-to-cradle?* C2C is a technological way of improving the environmental burden of products, so it can be assumed that it fits strongly to companies with a strong focus on the technology, which implies an important role for the supporting staff and the technocratic staff. Products often should be redesigned, or when this is not possible, totally new products should be designed. The company thus needs to be flexible and innovative. Both the machine bureaucracy and the organic structure seem to be suitable for C2C, although the machine bureaucracy would be not very fast in adopting it because of its risk-avoiding, centralized and process-controlling characteristics.

The organizational structure of the interviewed companies was investigated with the use of characteristics from Mintzberg's configurations 'organic structure' and 'machine bureaucracy'. Especially the scores on innovativeness, dynamic markets and decentralization scored high, which points in the direction of the organic structure. In box 3 these scores are given.

Box 3 – Mintzberg's configurations

The two configurations that were analyzed in the interviews were the organic structure and the machine bureaucracy.

Mean scores configuration (N=15, 7-point scale)

Configuration	Min.	Max.	Mean	St.dev.
Organic structure	4.20	6.80	5.52	0.91
Machine bureaucracy	4.00	6.83	5.52	0.84

The mean scores for both configurations were equal, but the scores on the different parameters were quite diverse.

Mean scores organizational characteristics (N=15, 7-point scale)

Characteristic	Mean score
Technocracy	4.93
Supporting staff	4.93
Dynamic market	5.87
Innovativeness	6.20
Mutual adjustment	5.40
Decentralization	5.53
R&D investments	5.20

The mean score on innovativeness is high for all companies. This indicates that the companies that are adopting C2C are innovative. This also holds for the dynamic market.

Processes

The first question related to processes asks: *What organizational systems are used for quality control and environmental care?* The INK/EFQM-model pays a lot of attention to the importance of processes in the company. The ISO 14000-series give a good view on environmental management systems. The second question related to processes asks: *How does the cradle-to-cradle methodology contribute to environmental management?* C2C is compared with preventive environmental management systems. C2C can contribute on a bigger scale, because it focuses on the whole company, or even the supply chain. This will bring the environmental management to a higher level. In box 4 some quotes from the interviews are given, regarding this question.

Current environmental measures that are aimed at preventing environmental harm are often comparable with parts of C2C. The main difference is that C2C is something that manifests itself in all parts of the business-process, which leads to an environmental awareness that should be implemented in the whole organization, and even in the whole chain. In C2C the company not only tries to make its products C2C, but also the production process and business process, which is only possible when the whole chain cooperates. The materials of the product, the production, the transport and the collection of the used products to reuse them, every part of this has to meet the C2C standards to make the product completely C2C.

Box 4 Environmental and quality processes

In the literature study the firm's environmental and quality care systems were analyzed as part of the process-level. Some of the interviewed firms gave examples of how they use life cycle assessment (LCA) and other environmental and quality care systems in their processes and how they compare this with their C2C activities.

LCA and C2C in interviewed companies

Firm	Quotes
9	The hype for C2C is bigger than for systems like ISO 9001 and 14000. LCA is cradle-to-grave, so we goes beyond LCA and use C2C. Our products have a long life cycle, so C2C is more logic.
10	You cannot compare C2C and existing EMS's. C2C is a competitive tool one adopts voluntary, while existing EMS's are often obligatory.
12	We combine C2C with LCA, so the environmental impact on all levels is analyzed. In LCA we measure the impact on the environment in every stage of the product's lifecycle. LCA is a better way to improve environmental and financial performance, because measuring delivers knowledge.
13	We use LCA to decide which materials we use. We work with LCA since 1994, so C2C fits perfectly in our company. C2C should not come instead of other care systems, because they are used for other purposes.
15	C2C has more potential that existing environmental systems, both on environmental as on financial perspective.

The scores for the C2C-characteristic 'materials' are quite high on the process-level, with scores around 6 on the 7-point scale. The mean score is 5.93. This means that most of the companies are seriously searching for alternatives for toxic materials, and search for ways to ban toxic and hazardous materials from their products.

Financial performance

The first question related to the financial performance asked: *What are the theories on the linkage of financial and environmental performance?* Prior research showed that there is a significant relation between environmental performance and financial performance. There are two ways in which this influence appears; by cost-savings and by an increase in revenues. Cost-savings are achieved by a more efficient production-process and savings on waste-treatment and levies. Increased revenues can be achieved by creating a 'green' image. The relation between environmental performance and financial performance also works the other way around. The financial performance also influences the environmental performance.

The second question related to financial performance asked: *How is financial performance influenced by the cradle-to-cradle methodology?* Many companies working with C2C are not yet that far in implementing the concept, that they can give a clear view of the financial consequences of it. C2C can be compared with preventive environmental management systems, so it might be expected that the positive relation between environmental management and financial performance also works for C2C, although there is not many information about it yet. C2C leads to cost-savings because it results in lower expenses on waste-treatment, raw materials, levies and energy. On the revenue-side C2C might help the company to get a better image by C2C certification and by the increasing attention in the media and by consumers for C2C products. In box 5 the results on the financial questions of the interviews are given.

Most of the interviewed companies did not have a clear view on the financial aspects of their C2C activities, because the implementation of C2C is still in a very early stage. However, the companies expected that the benefits of C2C will be higher than the costs, and that C2C will especially have a positive influence on the cost-savings and the image of the firm.

Box 5 – Financial performance and C2C

The expected positive influence of C2C on the financial performance is showed in the mean scores on benefits and costs, and will be mainly found in cost-savings and increased image.

Mean score costs (N=15, 7-point scale, 1=totally disagree, 7 = totally agree)

Question	Mean	St.dev.
Costs C2C will be higher than benefits	2.38	0.96

The mean reasons why companies expect C2C to be profitable are the revenues through increased image and the cost-savings.

Mean score benefits (N=15, 7-point scale, 1=no influence, 7 = strong influence)

Question	Mean	St.dev.
C2C cause benefits because of cost-savings	5.23	1.33
C2C cause benefits because of image	6.31	0.75

The interviewed companies gave different reasons for the expected financial results of C2C. Some quotes are given:

Firm	Quote
5	"We have benefits via PR and increased image"
6	"We have no experience on the benefits yet, but we get many positive reactions on our products, so we keep believing and continue our projects"
7	"At this moment especially the attention and promotion because of our C2C product is great. This definitely has a positive influence on our image". "Producing according to C2C is not more expensive than the regular way."
12	"Costs related to training and administrative tasks are ignorable when looking at the benefits"
13	"It is obvious that customers demand C2C products. We know we can make it profitable. Recycling of products attract new customers, which we do".

Overall conclusions

Combining the results from the literature study, it shows that there are two types of firms in which C2C could fit. The first type has a prospector strategy, an organic organizational structure, flexible and innovative processes and an aim on financial performance through increased image. In figure 2a this type of firm is represented. Characteristics of these types of firms are innovativeness, decentralization and flexibility. Many of the companies that participated in the interviews fit in these characteristics.

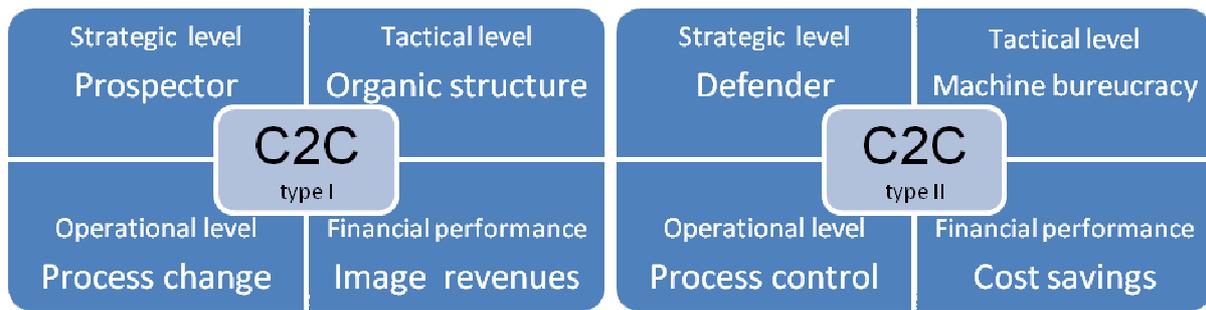


Figure 2a – Combined conclusions type I

Figure 2b – Combined conclusions type II

The other type of organizations that are suited for C2C adoption has a defender strategy, a machine bureaucracy configuration, a focus on process control and cost-savings. These firms are represented in figure 2b. Companies of the second type are risk-avoiding, have a stable environment and focus on control and efficiency. The interviewed companies had fewer similarities with these types of companies, although the focus on cost-savings was mentioned as a major benefit from C2C.

When taking a closer look at the characteristics of these two types, the companies of type I have similarities with early adopters, while the companies from type II are followers. They might be willing to adopt C2C, but only when it has proved to be beneficial and when the risks are minimalized. Because of the early stage of development of C2C, companies of the first type will be more suited to adopt C2C in an effective and profitable way. Also because of the required flexibility and innovativeness the companies from the first type are expected to adopt C2C sooner and benefit more.

Finally, the main research question of this thesis needs to be answered. So, “**How does C2C contribute to the firm’s for-profit goals?**” Literature study and interviews showed that C2C can contribute to the firm’s financial performance via increased revenues because of an increased image of the firm and via cost-savings because of the more effective use of materials, recycling, energy and water, and because of the lower costs for waste treatment.

In both cases it is necessary that the firm knows how to use these possibilities. The firm needs to know how to make use of their improved image. This requires a strong marketing department and a flexible organization. Cost-savings can be obtained when the firm has an innovative culture and the technological abilities to redesign their production process. Therefore, a strong R&D department and technocratic and supporting staff are needed. In order to receive cost-savings through recycling, a strong collaboration within the chain is necessary.

Taking these conditions into account, especially the early adopters with a prospector strategy, an organic structure and a focus on process-change will benefit.

Table of contents

Preface.....	- 4 -
Abstract	- 5 -
Management summary	- 6 -
Table of contents.....	- 12 -
Abbreviations	- 15 -
Chapter 1 – Introduction and Research Design.....	- 16 -
1.1 Conceptual Design.....	- 16 -
1.1.1 - Backgrounds - Project Context.....	- 16 -
1.1.2 - Research Objective.....	- 16 -
1.1.3 - Research Issue.....	- 17 -
1.1.4 - Research Framework.....	- 18 -
1.1.5 - Definitions of concepts.....	- 19 -
1.2 Technical Design	- 20 -
1.2.1 - Research material.....	- 20 -
1.2.2 - Strategy Data Collection.....	- 21 -
1.2.3 Structure report.....	- 22 -
Chapter 2 – The cradle-to-cradle methodology	- 23 -
2.1 Introduction.....	- 23 -
2.2 Backgrounds of the cradle-to-cradle methodology	- 23 -
2.3 Cradle-to-cradle compared to other environmental management tools	- 26 -
2.4 Motives for the cradle-to-cradle methodology.....	- 27 -
2.5 Critical notes on the cradle-to-cradle methodology	- 28 -
2.6 Conclusion	- 29 -
Chapter 3 – Strategy and stakeholders	- 30 -
3.1 Introduction.....	- 30 -
3.2 Strategy	- 30 -
3.2.1 – Porter.....	- 30 -
3.2.2 – Miles and Snow	- 32 -
3.2.3 – Similarities	- 33 -
3.3 Resource based view and dynamic capabilities	- 33 -
3.4 Alignment	- 34 -
3.4.1 - Backgrounds.....	- 34 -
3.4.2 - Fit in a C2C company	- 35 -

3.5 – Stakeholders	- 36 -
3.5.1 – Definition and history	- 36 -
3.5.2 – Categorization	- 36 -
3.5.2 – Stakeholder influence on environmental measures	- 37 -
3.5.3 – Stakeholder influence on the cradle-to-cradle methodology	- 39 -
3.6 Contribution of cradle-to-cradle to stakeholder goals.....	- 40 -
3.7 Conclusion	- 41 -
Chapter 4 – Organizational characteristics and processes.....	- 43 -
4.1 Introduction.....	- 43 -
4.2 Organizational characteristics	- 43 -
4.2.1 - Characteristics of the organization	- 43 -
4.2.2 - Organizational configurations	- 45 -
4.2.3 - Configurations and cradle-to-cradle	- 46 -
4.2.4 – Concluding remarks configurations.....	- 48 -
4.3 Organizational processes - systems for quality control and environmental care.....	- 49 -
4.4.1 - Systems for quality control	- 49 -
4.4.2 - Systems for environmental care	- 51 -
4.4.3 - Life cycle management.....	- 53 -
4.4.4 - Contribution of C2C to the environmental management	- 54 -
4.5 Conclusion	- 54 -
Chapter 5 – Financial performance	- 56 -
5.1 Introduction.....	- 56 -
5.2 Theory on financial performance and the influence of C2C, stakeholders, strategy and organizational characteristics.....	- 56 -
5.3 Example of the influence of C2C on financial performance.....	- 57 -
5.4 Influence of EMS’s on financial performance	- 57 -
5.5 Conclusion	- 61 -
Chapter 6 – Interview protocol	- 62 -
6.1 Introduction.....	- 62 -
6.2 Retro-perspective view on the research (sub)questions	- 62 -
6.2.2 - Answering of the research (sub-)questions	- 63 -
6.2.3 - Further investigation	- 64 -
6.3 Interviews	- 65 -
6.3.1 – Explorative research	- 65 -

6.3.2 - Set-up of the interviews	- 66 -
Chapter 7 Interview results	- 70 -
7.1 Introduction.....	- 70 -
7.2 General facts.....	- 70 -
7.2.2 – Sectors	- 71 -
7.2.3 - Size	- 72 -
7.2.4 - Cooperation with EPEA	- 72 -
7.2.5 – Conclusion general characteristics	- 73 -
7.3 Cradle-to-Cradle in the participating companies	- 73 -
7.3.1 C2C according to the respondents	- 74 -
7.3.2 - Score on C2C characteristics	- 74 -
7.3.3 Concluding remarks.....	- 77 -
7.4 Results per organizational level	- 77 -
7.5 Results organizational types.....	- 84 -
7.6 Results financial performance and C2C.....	- 86 -
Chapter 8 Conclusion and discussion	- 92 -
8.1 Introduction.....	- 92 -
8.2 Conclusions.....	- 92 -
8.2.1 – Conclusions upon the research sub-questions.....	- 92 -
8.2.2 – Conclusions upon the organizational characteristics	- 94 -
8.2.3 – Final conclusion upon the research question.....	- 95 -
8.3 Discussion	- 95 -
Literature references.....	- 97 -
Appendix 1 - Interview protocol.....	- 102 -
Appendix 2 – Correlation matrix	- 105 -
Appendix 3 – Clusters and Cronbach alpha’s	- 107 -
Appendix 4 – Non-parametric statistical tests	- 108 -

Abbreviations

C2C	Cradle-to-Cradle
CSR	Corporate Social Responsibility
EMAS	European eco Management & Audit Scheme
EM	Environmental Management
EMS	Environmental Management System
EPEA	Environmental Protection and Encouragement Agency
FMCG	Fast Moving Consumer Goods
ISO	International Standardization Organization
LCA	Life Cycle Assessment
LCM	Life Cycle Management
NGO	Non Governmental Organization
PR	Public Relations
R&D	Research and Development
RBV	Resource Based View
SME's	Small and Medium-sized Enterprises

Chapter 1 – Introduction and Research Design

In this thesis the contribution of the Cradle-to-Cradle methodology to the for-profit goals of companies is studied. In this chapter, the research design of this thesis is worked out. The research design consists of two parts: the conceptual design and the technical design. In the conceptual design the goal and the borders of the research are studied. In the technical design a description is given of the way in which this is achieved. In the structuring of the research design the methodology of Verschuren and Doorewaard (2000) is used.

1.1 Conceptual Design

The conceptual research design focuses on clarifying and limiting the field of research. In this paragraph the project will be defined by the research objective, research framework and research issue.

1.1.1 - Backgrounds - Project Context

Last decades there is more and more attention for the influence of industry on the natural environment. Environmental concern increased due to the rapid growth of environmental awareness in the late 60's and 70's. Much of the criticism of the environmental movement was directed towards industry. The majority of industries were inclined to avoid taking environmental measures unless they were obliged to do so. A major landmark of environmental awareness was *'Limits to Growth'*, published in commission of the Club of Rome. From the 70's onwards this began to change. Companies started to engage in environmental care, because they foresaw that environmental issues would be of growing importance in the future. At the end of the 80's numerous companies developed initiatives towards better environmental performance. New ways of cooperation between companies, governments and other stakeholders emerged. Government used new kind of policies and instruments to stimulate industry and to facilitate effective and efficient environmental management systems. These policies, organizational structures, company strategies and instruments together shaped the emergence of environmental management in industry.

Environmental management are "*all the efforts to minimize the negative environmental impact of the firms products throughout their life cycle*" (Klassen and McLaughlin, 1996). When these efforts are systemized environmental management systems are made. More and more companies implement environmental management systems. There are four main trends in environmental management (Van Koppen and Hagelaar, 2005):

- From clean-up technology toward clean technology.
- From a focus on the plant towards a focus on chains of production and consumption.
- From environmental control being a subordinated task toward an important part of the company strategy.
- From an opposite to a co-operative relationship of government and industry.

Within the environmental studies there are many different theories on environmental management and environmental measures developed. This research is focused on the *cradle-to-cradle* concept, also referred to as C2C, which is a concept that can be used in environmental management. C2C is described in the book of William McDonough and Michael Braungart; *Cradle to Cradle: Remaking the Way We Make Things*. In this book a new vision is given on sustainable development, which can be defined as 'development which meets the needs of the present without compromising the ability of future generations to meet their own needs (Brundtland, 1987). It goes even beyond this vision. It states that C2C does not only fulfill the needs of the next generations, it even exceeds these needs. In chapter two the cradle-to-cradle methodology is studied extensively.

1.1.2 - Research Objective

The research objective refers to an isolated and not overly extensive problem area of the project Context, that is manageable for the purpose of the research (Verschuren and Doorewaard, 2000). The objective of this research is:

To analyze the contribution of the cradle-to-cradle methodology to the for-profit goals of companies by making an analysis of relevant literature and performing interviews with companies that have experience with the cradle-to-cradle methodology.

1.1.3 - Research Issue

This paragraph deals with the information that is useful or necessary to realize the objective. The most efficient way to accomplish this is by formulating the central research question and several research sub questions (Verschuren and Doorewaard, 2000). The main research question of this thesis is:

To what extent does the cradle-to-cradle methodology contribute to the for-profit goals of companies?

The main research question is followed by a set of sub-questions that divide the problem in smaller parts. The sub-questions are divided in themes, according to the theoretical framework, which is presented in figure 1.1.

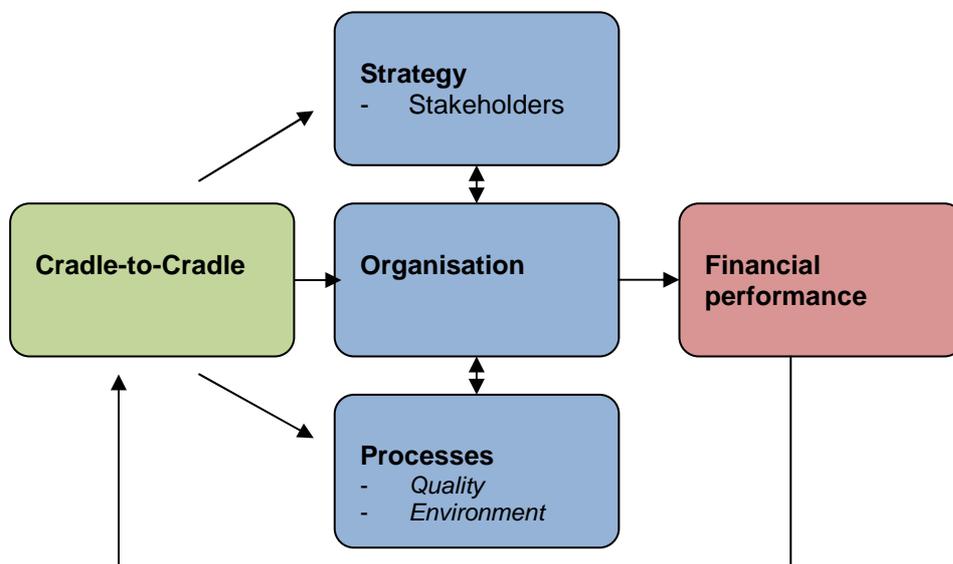


Figure 1.1 – Theoretical framework

The theoretical framework explains what is studied in this report. The middle column represents an organization and its environment. The characteristics of the organization are the strategy, the structure, and also the care systems that are used for quality control and environmental care. The company is positioned in a stakeholder environment. The way in which the company tries to cope with the stakeholder demands and wishes is represented by the strategy. The organizational characteristics are represented in the middle of the framework, the environmental and quality care systems are presented in the processes, in the lower part of the framework. Together, these three managerial levels from the organization. In this thesis is studied how C2C can fit in all three of these managerial levels.

At the left in the framework C2C is positioned. C2C is a tool which can be implemented in the company. C2C has to contribute to stakeholder satisfaction and the organizational resources and systems, to be adopted by the company. This thesis is focused on C2C, and how it contributes to financial performance. The financial performance is therefore also mentioned in the framework in figure 1.1. It is studied how C2C influences the financial performance, through the company, but also how the financial performance is influencing the adoption of C2C in the company. In the framework this is represented by the arrow from financial performance to C2C, which makes the model a closed cycle.

For all parts of this framework sub-questions are made, which helps to answer the main research question. Below the sub-questions are listed:

1) *Cradle-to-cradle*

- a) What is C2C?
- b) How is C2C related to environmental management systems?
- c) What are motives for C2C?

With the answers on these sub-questions an overview is given of the main aspects of C2C. Because C2C is a tool for environmental management, also the relation with existing environmental management systems needs to be analyzed. Motives for C2C are also important to get insight in the reasons for companies to adopt a tool like C2C.

2) *Strategy and stakeholders*

- a) How does C2C fit in existing theories about strategy?
- b) How does strategy align stakeholders and organization?
- c) What is the role of stakeholders in the environmental awareness of companies?
- d) What contribution does C2C make towards stakeholder goals?

With the answers on these sub-questions an overview is given of how C2C fits in the categorizations of strategy from different theories. This is important to get an overview of what kind of companies might adopt C2C. With the answers on the sub-questions about stakeholders an overview is given of the most important theories on stakeholder management and the influence of stakeholders on environmental awareness of companies. It is assumed that environmental awareness of companies is mainly influenced by the stakeholders, in the literature study will be analyzed which stakeholders have the biggest influence. It is important to see how C2C might contribute to a better stakeholder-relationship because of its contribution to the stakeholders' goals.

3) *Organizational characteristics*

- a) How can organizations be characterized?
- b) What characteristics are stimulating C2C?

With the theories on organizations an overview will be made of how different kinds of organizations can be distinguished and which characteristics of these different types of organizations are needed for the adoption of C2C.

4) *Processes*

- a) What organizational systems are used for quality control and environmental care?
- b) How does C2C contribute to environmental management?

On the process-level is focused on the systems for quality control and environmental care. Similarities with C2C are analyzed to see what kinds of processes are more open for the adoption of C2C than others.

5) *Financial performance*

- a) What are the theories about financial performance in relation to environmental care?
- b) How is financial performance influenced by C2C?

Financial performance is the most important goal of most companies. Therefore it is important to see what theory says about financial performance and the influence of environmental concepts on this. Because this thesis is about C2C, similarities between C2C and existing environmental care systems are analyzed also in relation to financial performance.

1.1.4 - Research Framework

The research framework is a systematic and visualized representation of the steps to be taken to realize the research objective. The project is divided in four main sections, as can be seen in figure 1.2. The first section is the literature study. Investigating the literature on strategy, stakeholder management, organizational structures and processes, financial performance and environmental management provides understanding about these subjects and how they relate. By studying literature about C2C, the information mentioned above can be applied in the

development of an overview of the theories about the impact of environmental management and C2C on the commercial goals of the companies.

In the second section this overview is worked out. This is also the part where the questions for the interviews are formulated. These questions are influenced both by the overview and directly by results of the literature study.

The third section is the part where the interviews will take place. The interviews will be used to gain extra information on the research questions from the literature study and to get examples of C2C working in practice. The interviews will be held with companies that already have experience with C2C, most likely in the Netherlands.

The last part of the research is the section in which the information from the literature study and the outcomes of the interviews will be used write the report.

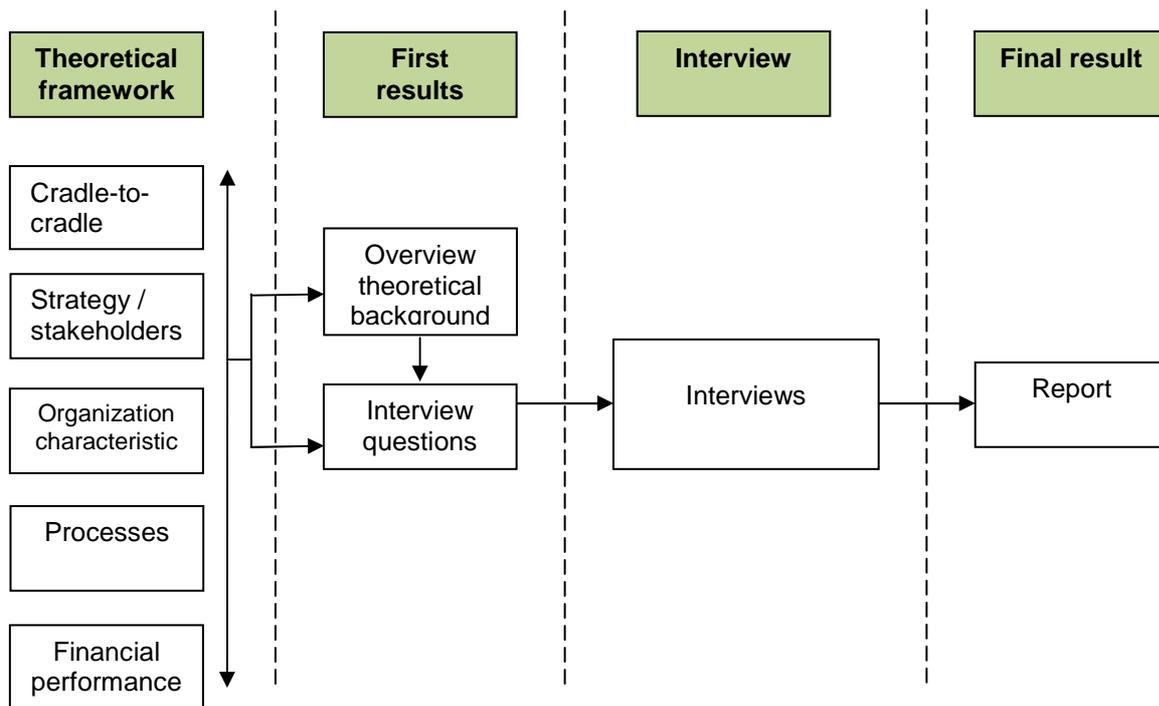


Figure 1.2 – Research framework

1.1.5 - Definitions of concepts

In this report several concepts are used. To make clear what is meant, an overview of the most important definitions is given.

- Cradle-to-cradle: The concept that states that products should be designed in such a way that these products could be re-used over and over again
- Alignment: Also: fit. The balance between the relevant contingencies in the business environment (external fit) and the firm's internal resources, competencies and capabilities (internal fit)
- For-profit goals: The financial performance indicators of a company
- Stakeholders: All people and organizations that are directly or indirectly involved in the company's activities
- Strategy: The creation of fit between the organizational characteristics and the stakeholders wishes, aiming at continuity
- Environmental management: The management of all components of the bio-physical environment, both living (biotic) and non-living (abiotic)

1.2 Technical Design

The technical design is the part of the research where is discussed how the research is carried out. First the research material is given, followed by the strategy. The last part is the structure of the report.

1.2.1 - Research material

Verschuren and Doorewaard (2000) distinguish five sources of information; individual people, media, reality, documents and literature. The source 'people' contains informants and experts. For this source interviews are useful. The source 'media' is comparable with the source 'documents', with as main difference that sources from the 'media', like newspapers and magazines, are addressed to no particular audience, while the source 'documents' is focused on a specific group, like in annual (environmental) reports. These sources are mostly seen as additional sources of information. The source 'reality' uses direct measurement, which is not suitable in this kind of research. The source 'literature' is the main knowledge source. This includes articles, specialist journals and (hand)books, both on paper and electronic.

In this research four of the five possible sources are used; people, media, documents and literature. These sources provide information about C2C, stakeholder management, corporate strategy, organizational characteristics and financial performance.

An overview of what information is gathered per source is given per area of sub-questions, comparing to the theoretical framework.

Sub-questions on C2C

Sources		Access
Individual people	Environmental managers	Interviews
Media	Newspaper articles on C2C	Search methods, extract information
	Magazines on C2C	Search methods, extract information
	Television documentaries on C2C	Search methods, extract information
Literature	Books on C2C	Search methods, extract information
	Scientific articles on C2C	Search methods, extract information

To get a clear picture of C2C first a quick content analysis is done. This means that from the different media sources with a large quantity of textual and audio-visual material only the relevant information is extracted. This information is combined with more scientific literature, which consists of several articles and the cradle-to-cradle book of McDonough and Braungart. To answer the sub-question about the motives for adoption of C2C also companies which already work with C2C will be interviewed. In these interviews the relation between C2C and other environmental measures is discussed. The interviews with the environmental managers of companies that implemented C2C will be pre-structured, so they can be more easily compared with each other. These interviews will also contain questions about some of the other sub-questions.

Sub-questions on strategy and stakeholder management

Sources		Access
Literature	Books about strategy	Search methods, extract information
	Scientific articles about strategy	Search methods, extract information
	Books about stakeholder management	Search methods, extract information
	Scientific articles about stakeholder management	Search methods, extract information

The books and articles about corporate strategy will be used to get an overview of the major theories about strategy and how strategy can align stakeholders and organizations. From the books and scientific articles about stakeholder management an overview is made of the main theories about stakeholders and their influence on the company. To get more information about the way stakeholders influence companies in adopting C2C also theory about stakeholders and environmental management will be studied.

Sub-questions on the organizational characteristics and processes

Sources	Access
Individual people	Environmental managers
Literature	Interviews
	Books about organizational management
	Search methods, extract information
	Scientific articles about organizational management
	Search methods, extract information
	Books about environmental care and quality control
	Search methods, extract information
	Scientific articles about environmental care and quality control
	Search methods, extract information

With scientific articles and books an overview is provided of the theories on the characteristics of organizations and what systems are used for quality control and environmental care.

In interviews with managers of companies that use C2C, questions are included about to what extent C2C contributes to the environmental management and financial performance of the company, but also to the way the companies are structured.

Sub-questions on financial performance

Sources	Access
Individual people	Environmental managers
Literature	Interviews
	Books about financial performance
	Search methods, extract information
	Scientific articles about financial performance
	Search methods, extract information

In the interviews with environmental managers of companies that use C2C also questions will be included on the financial consequences of adopting C2C. Because many companies are not yet that far in implementing C2C, the financial consequences are not very clear. Therefore the perception of the environmental managers about the profitability is taken into account. With the information found in books and scientific articles about financial performance also an overview is given of theories on financial performance and the way this is influenced by strategy, organizational characteristics and C2C.

1.2.2 - Strategy Data Collection

The research strategy is the kind of approach that is used to come to a coherent decision about the way in which the research will be carried out. Verschuren and Doorewaard distinguish three decisions that have to be made:

- depth versus breadth
- quantitative versus qualitative
- desk research versus empirical research

Depth versus breadth

Although this research relates to many different areas such as stakeholders, strategy and organizational characteristics, the main focus in this research is depth. This means that the research is mainly focused on a small-scale approach. The research is limited because the main focus is on C2C.

Quantitative versus qualitative

In this thesis mainly qualitative research is used. With literature study and several interviews the research questions are answered. In qualitative research the interpretation of literature and interviews is important. There is hardly any quantitative data available about C2C in the Netherlands, or even in any other country, so within the boundaries of this thesis the choice for qualitative research is made.

Desk research versus empirical research

The desk research strategy is the main research strategy. This will be applied for the theoretical part of the project. Scientific literature will be used to gain insight in the theories about stakeholders and strategy, organizational characteristics, financial performance, C2C and environmental management. The theories will be compared and combined. Besides the desk research strategy also interviews will be held with companies that already work with C2C. The results of these interviews will be used to write the conclusions, discussion and recommendations for further research.

When the three decisions that are mentioned above are made, Verschuren and Doorewaard mention different research strategies. Besides several strategies that are more useful for quantitative research, like surveys and experiments, they also mention strategies that are more suited for qualitative research, such as the grounded theory approach, the case study and the desk research. The grounded theory approach is merely focused on the development of new theories. The case study and the desk research are more suited for explorative and in-depth studies. The strategy chosen for this thesis is a combination of the case study and the desk research. The main part of the research is a literature study. By studying literature on all the five elements of the theoretical framework, C2C, stakeholders and corporate strategy, organizational structures, processes and financial performance, most of the sub-questions can be answered. The sub-questions that cannot be completely answered will be included in the interviews that will be held. The interviews are done with companies with experience in C2C. These companies serve as practical cases that can help to verify the answers that are found by literature study. Because there is not very much known about C2C and because there are few companies working with C2C, the interviews will be explorative. According to Baarda and De Goede (1995), this means that they are used to get an impression of the characteristics of companies working with C2C, and to see if there are possible relations between these characteristics. It is not meant to generalize the answers or to find reliable evidence for existing theories or hypotheses.

1.2.3 Structure report

This report is structured in eight chapters. First the research design is discussed. In this chapter the background of the problem and the methods of the research are described, as well as the research object, research issue and the research framework.

The next four chapters deal with the literature study. In chapter two C2C is studied, in the third chapter strategy and stakeholders. The organizational characteristics and processes are studied in chapter four, followed by chapter five, in which financial performance will be analyzed.

In chapter six the strategy for the interviews will be discussed. In chapter seven the results from the interviews will be analyzed. In chapter eight the literature study and the interviews will be combined in the results and conclusions, and recommendations will be made.

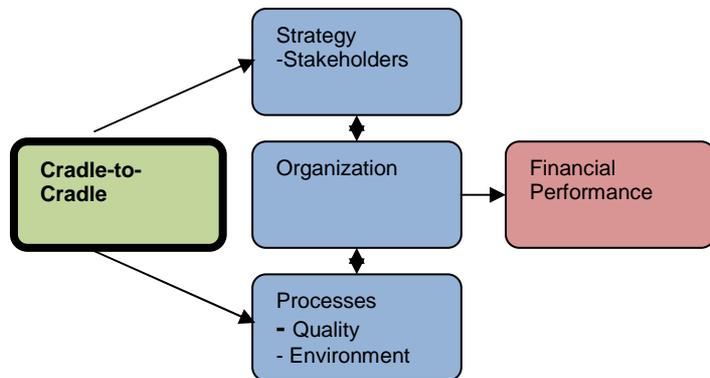
Chapter 2 – The cradle-to-cradle methodology

This chapter is part of the literature study. In the following chapters each subject from the theoretical framework as mentioned in § 1.2.3 is studied. This chapter is the first chapter from the literature study and will deal with the cradle-to-cradle methodology.

2.1 Introduction

In this chapter theory about the cradle-to-cradle methodology is analyzed. The sub-questions formulated in chapter 1.2.3 will be the guideline in the structure of this chapter. The sub-questions asked what C2C is, how it is related with environmental management systems and what the most important motives are for adopting C2C.

With the answers on these sub-questions an overview is given of the main aspects of C2C (§ 2.2). Because C2C can be used as a tool for environmental management, also the relation with environmental management systems are analyzed (§ 2.3). Motives for C2C are important to get insight in the reasons for companies to adopt a tool like C2C, so this also will be analyzed (§ 2.4). To get a honest view on C2C also the critics on this methodology are mentioned (§ 2.5). This chapter ends with a conclusion, in which the answers on the sub-questions will be extracted and summarized from the theory (§ 2.6).



2.2 Backgrounds of the cradle-to-cradle methodology

In this paragraph the basic ideas of C2C are analyzed. Different aspects of C2C are discussed, the main ideas, the downcycling versus upcycling theory, eco-effectiveness, biological and technological life-cycles, the certification process and the adoption of C2C in the Netherlands.

2.2.1 - Main theory – “Less bad” is no good

C2C is a relative new idea, described in the book of William McDonough and Michael Braungart: *Cradle-to-cradle, remaking the way we make things* (McDonough and Braungart, 2002). In the cradle-to-cradle book a new vision is given on sustainable development, which can be defined as ‘development which meets the needs of the present without compromising the ability of future generations to meet their own needs’ (Brundtland, 1987). It goes even beyond this vision; it states that C2C does not only fulfill the needs of the next generations, it even exceeds these needs.

The current methods of environmental care are merely focused on reducing the negative impact of products on the natural environment. The main focus is on the *three R's*; reduce, reuse and recycle. C2C considers these *three R's* as not sufficient. Reducing waste and toxic gasses is an important step forward compared to doing nothing, but it does not come further than trying to be less bad. The authors of the c2c book state that instead of being less bad it must also be possible to produce in a good way, without harming the environment. Producing in a good way starts at the developing phase, where products are designed. In the current design process for new products there is hardly any concern about the degree of recyclability of the products. The industrial infrastructure is focused on making a product and getting it to a customer quickly and cheaply without considering much else. Because the products are not designed to be recycled, the products are not recycled or reused, but end up in a landfill or incinerator. McDonough and Braungart are wondering how it is possible that the human race is the only specie that removes high-value materials from the earth and replace them with useless or even toxic waste products. When this does not change, the earth will become more and more unable to sustain human life. The earth is running out of raw materials and filled with toxic waste. The current production processes are therefore defined as cradle-to-grave production.

2.2.2 - Downcycling versus upcycling

Of course there are many projects trying to stimulate and realize reuse and recycling. This is however happening in an incomplete way. All reused or recycled products lose quality in the current production processes. It is of a lower quality than its previous form, until it is not even useful for recycling anymore. After being reused or recycled a few times, the quality is at such a low level that the product and its materials still end up at a landfill or incinerator, where the process from *cradle till grave* is finished. McDonough and Braungart state that these kinds of recycling are therefore not what recycling should be. The current way of recycling is described as *downcycling*, because of the loss of quality.

An example of this downcycling is paper. When paper is recycled, it can be used for products of less quality. When this is done four or five times, the fibers in paper are not strong enough anymore to be reused anymore, so it ends up in an incinerator. Here it is used to produce energy, hereafter it is 'gone'. However, it is not possible to be 'gone', small parts of the -toxic- material are released to the environment and are absorbed in the atmosphere. In the example of recycled paper also the residual toxic inks and the short fibers are released in the atmosphere. Besides this there are many examples of consumer goods that cannot be recycled, not mentioning the industrial waste that was generated while producing these products. With this kind of recycling, downcycling, the problem is not solved. There need to be focused on the root of the problem, instead of trying to slow the problems down. C2C wants to replace downcycling by recycling without loss of quality. C2C even tries to increase the quality of the materials in the next life-cycle, so instead of recycling even *upcycling* should be possible (McDonough and Braungart, 2002).

2.2.3 - Eco-effectiveness

The current environmental management systems focus on eco-efficiency, a term that is used a lot since the Rio Earth Summit of 1992. Eco-efficiency means that machines will be refitted with cleaner and faster engines, materials will be used more efficiently and there will be done more with less. In C2C the eco-efficiency is replaced by eco-effectiveness. Instead of using less materials and reducing waste, there need to be ways to design industries that actually help the planet. When C2C will be implemented in industry, it will be possible to design an integrated model in which every material taken from the earth will remain useful, either in its original form or in a new form, which makes the concept 'waste' no longer exist. The keyword in this is eco-effectiveness, designing industries that are even bigger and produce better than the current industries, but in a way that protect the earth. This can also be profitable for companies, because of reducing the costs of treating, shipping and storing waste and efficiently recapturing valuable raw materials that retain their full industrial utility.

This closed cycle is referred to as '*waste equals food*', because all waste will be useful for reuse, either as a half-product or as a raw material. McDonough and Braungart ask consumers to ask themselves three questions: Is the product eatable? Is it recyclable? Can it be used as fuel to produce energy? When consumers ask these questions when they buy products, the waste equals food principle will be possible.

2.2.4 - Biological and technological cycles

The three questions that were asked at the end of §2.2.3 already assume that there are different cycles within C2C. Products can consist of two kinds of materials; biological and technological. Biological materials must return in the biological cycle. In the biosphere industrial byproducts and wasted materials can become nutrients like food or fertilizer. Technical materials must return in the technical cycle. In the technosphere industrial byproducts and wasted materials can be used as high-value industrial inputs. Customers no longer buy products that are thrown away after their use or when they want replacement. Customers buy the service of products, and when they are finished with the products, or simply want to upgrade to a newer version, the manufacturer will take back the old ones, break them down, and use their materials in new products (McDonough and Braungart, 1998). It is important that the products will be easy to dismantle and reuse. This is a challenge that must be met in the design of the product.

2.2.5 - Cradle-to-cradle certification and EPEA

Companies that produce products according to C2C can achieve a C2C certification for these products. The C2C certification consists of four possible certifications; Basic, Silver, Gold, and Platinum. These four levels reflect the continuing improvement along the C2C trajectory. The certification program applies to materials, sub-assemblies and finished products. There are five aspects on which the company should perform in a certain way, which are the usage of materials, recycling, water and energy usage and social responsibility. These criteria, which can be found in the cradle-to-cradle certification criteria, are as follows:

- Materials: the product is designed in such a way that none of the materials used to produce it contains hazardous or toxic elements.
- Recycling: the usage of recycled materials which can be recycled again
- Water: saving water during the production process and taking care that the water that leaves the company is clearer than how it entered
- Energy: effective use of energy, while using sustainable energy sources
- CSR: the company has a strategy for corporate social responsibility and ethical standards and has embedded this in the organization.

For each level of certification different minimum standards are set. For example, in the silver-certification a recycle-rate of 50% is required, while in the gold-certificate 65% recycling is the minimum (McDonough and Braungart, 2007).

Certification is only possible through official C2C-certification institutes. In Europe, this is EPEA, the Environmental Protection and Encouragement Agency, which is an international scientific research and consultancy institute that improves product quality, utility and environmental performance via eco-effectiveness. EPEA was founded by one of the authors of the cradle-to-cradle book, Michael Braungart. EPEA works with clients worldwide to apply the C2C methodology to the design of new processes, products and services. EPEA states its mission as:

It is EPEA's ambition to mainstream the Cradle to Cradle methodology and practice. In such context, "environmental protection" will have lost its meaning, as we shall live happily in harmony with our natural environment, guilt ridden "ecological footprints" being a distant memory.

EPEA offers:

- Issue identification → identifying social and environmental issues
- Reverse environmental engineering → identify errors in past design process
- Development of Preference Lists → the best identifiable materials
- Know-how management in the supply network → EPEA facilitates the B2B relationships in supply chains as a know-how trustee.
- Education and training → education programs and skill enhancement workshops on environmental- and design-related issues

Companies with C2C products still are the official owners their intellectual property with regard to the products and inventions they produce. Marketing claims referring to cooperation with EPEA and results achieved from the application of C2C design, including lists of preferred raw materials and chemicals, are proprietary to EPEA.

2.2.6 - Cradle-to-cradle in the Netherlands

In the Netherlands C2C is adopted by a number of companies. On different websites overviews are given of companies working with C2C and of products that are designed according to C2C.¹ Most of the companies working with C2C do this on a small scale. Most of these companies are, at this moment, situated in the chemical and manufacturing industries. It is important to realize that C2C is relative new in the Netherlands, and that the attention it gets in the media is growing. It might be expected that within short time more and more companies will adopt (parts of) C2C. Also government gives attention to C2C, for example the municipality of Venlo and Wageningen.

¹ See for example cradletocradle.nl and cradletocradleplanet.nl

2.3 Cradle-to-cradle compared to other environmental management tools

In this paragraph C2C is compared to other existing environmental measures. First, it is important to analyze what position C2C has in environmental management. Environmental management is the way in which a company tries to change its influence on the environment. This is achieved by an environmental policy, in which the company describes what they want to achieve. This policy is a start for the environmental measures that a company can implement. C2C is a way of thinking that can be used in setting up the environmental policy, but it also has a great impact on the measures that can be taken. C2C is a methodology that comes near to an ideology, so it is something which not only is used as a measure, but which also manifests within the policy and management of the company.

Last decennia, several environmental theories and environmental measures emerged, varying from reducing harmful emissions to environmental friendly products. A more detailed example of some environmental measures is given in chapter 4.4. In this paragraph the focus is on the comparability of C2C and existing environmental measures and theories. As is described in the previous paragraph, C2C is different from other environmental methodologies because it is focused on eco-effectiveness instead of eco-efficiency. Eco-efficiency means that machines will be refitted with cleaner and faster engines, materials will be used more efficiently and there will be done more with less. In C2C the eco-efficiency is replaced by eco-effectiveness. Instead of using less materials and reducing waste, there need to be ways to design industries that actually help the planet. Another main difference is that many environmental measures are focused on reducing the harmful results of the current production-processes, while C2C is merely focused on preventing these.

When companies implement environmental management, there are four stages of environmental management in which they can be, varying from minimal environmental efforts till a more or less complete integrated care for environment. The four stages are the clean-up stage, the process-oriented stage, the product-oriented stage and the chain-oriented stage (Bremmers and Omta, 2003). The first three stages are stages of internal environmental care. The fourth stage is chain management care, in which not only the company, but the whole chain is involved.

In the *clean-up stage* there is no environmental care system implemented. When an environmental problem occurs, the company tries to solve it, but there is no standard procedure. The focus is on simple house-keeping measures. Governmental legislation is the guideline for environmental policy. Sometimes this is also called the zero-stage: there is no awareness of environmental problems at all. For example many SME's lack the resources to implement environmental measures and therefore only solve the problems that occur.

In the *process-control stage*, environmental measures are integrated in the operational performance of the company. The company addresses its environmental problems in a more systematic way like waste and emission programs (WEP) or environmental management systems (EMS).

In the *product-focus stage*, increasing attention is paid on product- and process redesign. Although this is still an internal oriented stage, the communication to the stakeholders is increasing. In this stage environmental reporting is important, to inform stakeholders about the environmental goals and results of the company. It may also stimulate other companies and other customers to become more aware of environmental impacts of the production process.

The *chain-oriented stage* includes the care for the physical flows as well as the co-operation with other partners in the supply chain. The company extends its environmental management beyond its own production process, to the whole product chain. In other words; the crisis-oriented company only complies to rules and regulations, the process-oriented company strives for control of the environmental burden and the chain-oriented company aims for the reduction of the environmental burden in the whole chain.

C2C could be used in the product-focus stage, because of its focus on product and process redesign, but also in the chain-oriented stage, because of the fact that the whole chain needs to cooperate to make C2C work.

Besides this classification in different stages from Bremmers and Omta (2003), also following hierarchy from Van Koppen and Hagelaar is helping to identify similarities with C2C. A major distinction that can be made is between preventive and non-preventive measures (Van Koppen and Hagelaar, 2005). Preventive options try to avoid pollution by changing the process or products. Non-preventive options focus on reducing the pollution. The following hierarchy is made:

1. Changes in products (eco-design) → changing the product
2. Changes in process inputs (less or environmentally preferable - renewable - raw materials, less or renewable energy)
3. Changes in process technology (integrated, cleaner technology)
4. Changes in process operation (good housekeeping)
5. On site reuse (reuse of raw material, or useful application for other purposes)
6. Off site reuse
7. Emission control measures (end-of-pipe technology)
8. Controlled treatment and disposal of waste (incineration of waste with utilization of energy value; secure land filling)

The first five options are considered to be preventive. The last three options are less or non-preventive. Of course, these three options cannot be compared with C2C. The five preventive options have in some way comparisons with C2C. The first option, eco-design, overlaps in a great deal with C2C, which is also focused on the design-phase of the product. Changes in process inputs and technology are often a direct result of the re-designing of products in C2C. When the company wants to change the product according to the C2C ideas, this often implies change of the inputs. C2C products consist of materials that can return in their life-cycle, either the biological or the technological, and therefore they also need to be easily disassembled. Therefore the product is build of new materials and in a new design. C2C also focuses on the way products are produced, so the technologies used in producing are considered as well.

The fourth option can fit in C2C, but is not really a characteristic of C2C, but more a logical implication. The fifth option, on-site reuse, is something which can fit very well in C2C, when it is done according to the C2C principles. This would mean that materials are reused, without reducing the quality of them.

2.4 Motives for the cradle-to-cradle methodology

There are several motives that can be distinguished for adopting C2C in a company. Three different areas of these motives can be distinguished, which fits in the *triple-top line*, an important example in C2C to describe the three areas on which C2C focuses (McDonough and Braungart, 2002-b). In this triangle three important values are described; ecology, equity and economy. The ecology-value represents the environmental values, the economy-value represents the financial values and the equity-value is a representation of the social values. Thinking according to the triple top line means that the company searches for a way to balance between these three values. In figure 2.1 this triangle is represented.

The different smaller triangles in this triangle represent the different positions a company can have, where the triangle in the centre represents the perfect balance between all three areas.

Motives for adopting C2C are also found in these three areas. The environmental, financial and social motives will be discussed in the following paragraphs.

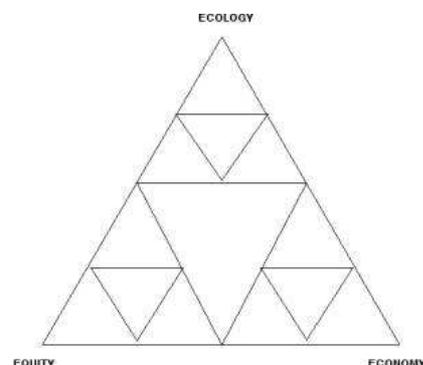


Figure 2.1 – Fractal triangle

2.4.1 - Environmental motives

The benefits for the environment that are the result of C2C are clear. When companies produce according to C2C there will not be any waste anymore. All raw materials will return in the technological or biological cycles. Besides this, the production process will become more efficient as well, which saves raw materials. Toxic materials, like many chemicals and paints, which cannot be included in the lifecycles of C2C, will be forbidden. This means that there will be searched for alternative materials that can be used to make the same product, but which are not toxic and can be recycled in either the biosphere or the technosphere (McDonough and Braungart, 2002). Organizations that have company goals relating to minimalise the environmental burden of their production processes will absolutely have a match with the ideas of C2C.

2.4.2 - Financial motives

All companies have as major goal continuity, which in most cases leads to goals like optimizing the financial performance. Goals regarding the environment are usually subordinate to the financial goals. Therefore it is of great importance to analyze the financial motives for C2C. As is stated in the beginning of this paragraph, the financial motives can be divided in two parts; the motives according to the positive image of the firm and the motives that are related to the cost savings that may occur when using C2C.

When companies can show that they care about the environment this usually has a positive influence on the image of the company (Miles and Covin, 2000). When environmental measures are implemented, such as C2C, companies can show to their stakeholder that they have environmental awareness. Especially when a firm can get a certificate, which is also possible in C2C, this is an important motive. In the chapter three these stakeholder influences this will be dealt with in more detail.

The second major financial motive which is more tangible is the cost saving that may occur when a company adopts C2C (Klassen and McLaughlin, 1996). There are three ways in which a company can realize cost savings while using C2C. First there are the cost savings that are realized by using the raw materials more efficiently. Second there are the cost savings that occur because the company needs fewer raw materials, due to the recycling of used products. Third, costs can also be saved because the company needs fewer investments for the cleaning and filtering of the waste-flows that occur during the production-process. The company also is more flexible because the governmental criteria are met earlier.

2.4.3 – Social motives

The third category of motives for the adoption of C2C is from a social point of view. In the book about C2C, a complete chapter is focused on the social aspect of C2C. The authors describe this as 'respect diversity', which means that the company should take into account what the local possibilities are. They state that all sustainability is local oriented, by using local materials and labour, but also generate local sources of energy, for example by windmills or solar energy.

2.5 Critical notes on the cradle-to-cradle methodology

Of course there can also be made some critical remarks on C2C. Although there is no doubt about the good intentions of the founders of C2C, there are parts of the methodology that are not very clear, and assumptions are made that are questionable. The most often heard critical remarks are as follows:

- C2C is mainly focused on the design-phase. Companies at the end of the chain have fewer possibilities to apply C2C.
- C2C only works in a world where every company and every government join the ideas and is willing and able to cooperate.
- C2C assumes that an unlimited economical growth and population growth is possible. C2C is a technological fix and assumes that the modern lifestyle and consumption pattern do not need to be changed. This is questionable, because even if the limits can be stretched, at a certain moment in time they will be reached.
- The C2C book is not very positive about governmental influences. However, it is not very likely that C2C will be adopted on a large scale without governmental restrictions.

- The results of C2C on transport and energy use are poorly argued in the book. In later publications McDonough and Braungart focus on solar energy as the solution for the energy needs, but the argumentation for this is still weak.
- Not every product can be 100% biologically recycled. The rest-products will end up in the technosphere, which results in a growing technosphere in relation to the biosphere.
- The certification of C2C is done by an organization that is owned by the founders of C2C. Therefore, there might be a conflict in interests. Besides that, one has to pay not only for certification, but also for lists of C2C materials, so it is not even possible to design a C2C product without cooperation with the certification organization. This makes C2C a for-profit concept, which will be less likely to be supported by the government.

2.6 Conclusion

In this chapter C2C is studied. In the sub-questions from § 1.2.3 was asked what is C2C is, how it is related to environmental management systems and what the motives are for adopting C2C. These questions are answered in this chapter.

To answer the question "*What is cradle-to-cradle?*", C2C is described as a concept that is aiming to eliminate waste, by recycling all materials without losing quality. To achieve this, products needs to be (re-)designed in such a way that all materials can easily be disassembled and returned in their biological or technological lifecycle. Also the production-processes needs to be redesigned, to improve efficiency, spare water and energy and avoid pollution.

When comparing C2C with existing environmental care systems, especially the environmental care systems aimed at pollution prevention and life cycle management have much in common with C2C. C2C is aimed at the prevention of waste and needs to be implemented in adjustment with the chain. The main difference with existing environmental systems is its focus on both financial and social improvements besides the ecological improvements, each with equal importance. Therefore C2C is something that manifests itself in all parts of the production-process and on all organizational levels, and also focuses the other actors in the chain. This answers the question "*How can C2C be compared with existing environmental management tools?*".

The last sub-question that is answered in this chapter asked "*What are the motives for cradle-to-cradle?*" The main motives for adopting C2C were found in the environmental, financial and social areas. Adopting C2C leads to better environmental performance, so companies striving for lowering the environmental burden of their organization might use this as a reason to adopt C2C. Also from a social view C2C leads to better relations with the employees and the local stakeholders. This might be a reason for companies who want to be leading in for example CSR. The financial motives are however the most important, because C2C can result in cost-savings, due to improved efficiency and reusing (raw) materials, but also in an increased "green" image of the firm.

C2C certification is possible through cooperation with EPEA (in Europe). The certification criteria focus on the use of toxic materials, recycling, the use of solar energy, water-usage and social aspects.

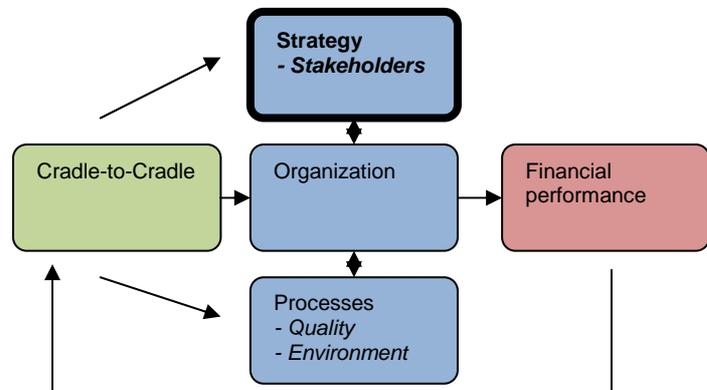
Chapter 3 – Strategy and stakeholders

This chapter is part of the literature study. It is the first of the chapters about the organization.

3.1 Introduction

This chapter is focused on strategy and stakeholders. First is analyzed how strategy and C2C can be compared, by analyzing some well-known strategic theories and compare them with the C2C characteristics from chapter 2 (§ 3.2 and 3.3). Then the concept of fit is analyzed. As the third hypothesis states, fit is very important for the company. The backgrounds of fit and the different areas on which fit can be achieved are analyzed (§ 3.4). Because in this thesis strategy is mainly seen as the way in which the company deals with its environment, stakeholders are analyzed.

The influence of stakeholders on environmental awareness and environmental management of the firm is studied (§ 3.5), followed by a short analysis of how C2C influences stakeholders (§ 3.6). The chapter is ended with a conclusion, in which is focused on answering the related research sub-questions and the second and third hypotheses (§ 3.7).



3.2 Strategy

Strategy is focused on the long-term decisions for the company. In this thesis especially the focus of the firm on its environment is seen as an important aspect of strategy, which is the reason for analyzing stakeholder strategy, in § 3.4. There are many different theories on strategy, which of course will lead to many different definitions. The definition of Michael Porter is maybe the most known, where strategy is defined as 'creating fit between the activities of a company' (Porter, 1996). This definition is merely internally focused. A more extensive definition is strategy as 'a series of goal-directed decisions and actions that match an organization's skills and resources with the opportunities and threats in its environment, to meet the needs of the markets and to fulfill stakeholder expectations' (Omta and Folstar, 2005).

In the next sub-paragraphs the theories of Porter and Miles and Snow are mentioned. These are two of the most well-known theories about the strategic orientation of companies.

3.2.1 – Porter

One of the most important authors on strategic thought is Michael Porter. In his theories he states that the fit between organizational activities is very important. Strategy is the creation of this fit. With this fit an unique and valuable position can be created. A well-known model of Porter is the five-forces model, in which he describes five forces that are the most important forces in competition (Porter, 1998). In figure 3.1 these five forces are illustrated.

The company should place itself in industry in such a way that it can use its competitive advantages in an optimal way. The five forces that are described in this model are the entrance of competitors, the threat of substitutes, the position of suppliers, the position of sellers and the competence between the current players in the market. Together, these five forces determine the environment of the company, including the potential profits. When the company analyses these forces it can determine its own strong and weak sides. With this knowledge the company can work towards a way in which the five forces can be dealt with in the most effective way.

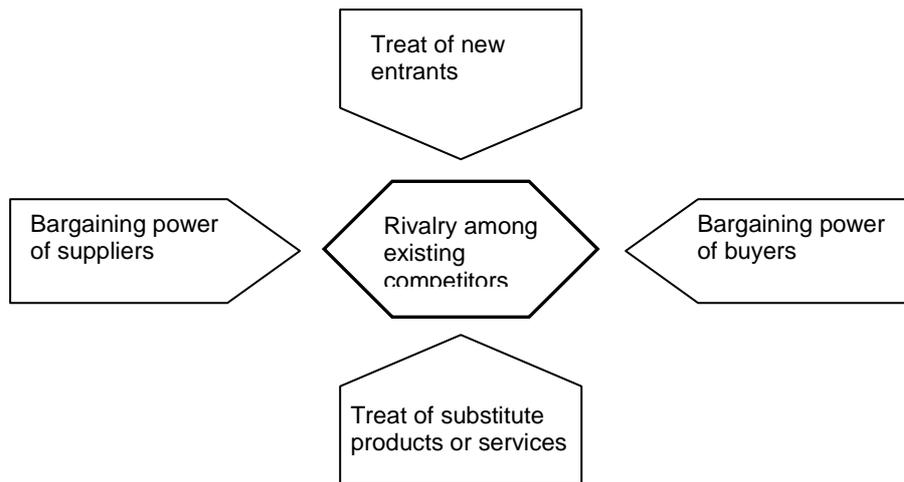


Figure 3.1 – Porters five forces

To achieve this, Porter describes three generic strategies; differentiation, cost-leadership and focus (Porter 1980). In figure 3.2 this is illustrated. Differentiation means that the company is going to produce something that is not (yet) available in the market. This can be very small-scale, for example a product modification, or on a larger level, for example when the company is producing a new product. Cost-leadership can be reached by economies of scale, avoiding small-scale buyers, experience, cost-control and efficient producing. Focus means that the company does not want to serve the whole market, but only a small part. A specific defined group of customers can be served better and with more attention to the wishes of these customers, that companies that are focusing on the whole market can do. With this niche-market the company can distinguish itself from other companies.

In practice, it is almost impossible to use more than one of these generic strategies. The company needs to decide which one it wants to use. By focusing on one of these three strategies the company can reach a strong position in its market.

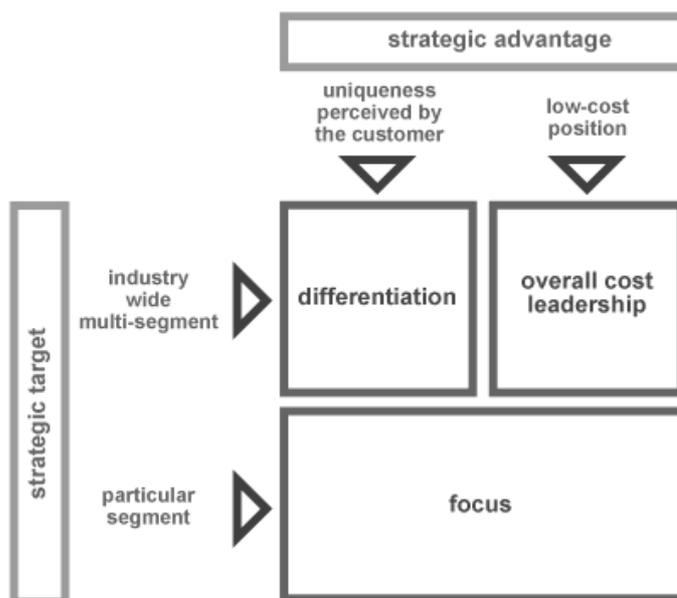


Figure 3.2 – Porters three generic strategies

In this thesis it is interesting to see how companies deal with external forces, as mentioned in Porter's five forces. This is done in § 3.4, where stakeholders are analyzed. It is also interesting to see what effect C2C has on Porter's strategies. C2C may influence the image of the company or the cost-savings in the production process. A company that has a cost-leader strategy will

probably be more interested in the cost-savings that C2C may cause, while a company with a differentiation strategy may be more focused on the unique aspects of the C2C products and the 'green' image of the firm.

3.2.2 – Miles and Snow

Another well-known theory is the theory of Miles and Snow. Miles and Snow state that different corporate strategies are the result of the way in which companies deal with the three main problems of each company; the entrepreneurial problem, the technical problem and the administrative problem, which together form the 'adaptive cycle' (Miles and Snow, 1978). The entrepreneurial problem deals with the way in which the company should manage its market-share. The technological problem deals with how the company should implement the solution it has found for the entrepreneurial problem. The administrative problem deals with how the solutions for the first two problems can be managed, and how the company should be structured to implement these solutions. Based on this, Miles and Snow defined four categories of companies; defenders, prospectors, analyzers and reactors.

Defenders are full-grown companies in a full-grown market. They try to protect their position in the market by efficient production, strong control mechanisms, continuity and trust-ability. This kind of companies function optimal in stable markets, where they try to be the cost-leader, aim at niche-markets and use standardized technological processes to maintain low costs. Efficiency is maintained by formal procedures, centralization and vertical integration.

Prospectors are companies that try to exploit new chances, develop new products and create new markets. Marketing and R&D are very important for this kind of companies. Efficiency is less important than creativity. The prospector is always looking for ways to innovate. This is done by cooperation between different departments within the company, having a low amount of management-levels and decentralization. Prospectors are performing at their best in dynamic markets and in situations of uncertainty.

Analyzers avoid big risks, but exceed in delivering new products. These kind of companies concentrate on a certain range of core-products, in which it tries to differ in the quality of the products. The analyzer is open for new products, which it will adopt when it seems to be an acceptable risk. The analyzers are some kind of balance between defenders and prospectors. The main problem for these companies is to combine the efficiency of existing products and technologies and the flexibility that is needed for new products. Often these companies act on a smaller scale, so it is difficult to implement new developments quickly as well.

Reactors are the fourth category. This kind of companies have limited control of their environment, they cannot assimilate to external competitors and lacks effective internal control-mechanisms. These companies do not have a clear strategy, and are therefore not often taken into account in management-literature. In this thesis the reactors will not be mentioned furthermore neither.

Miles and Snow state that there is not one of these categories that can be mentioned as the best one. In different situations different types of companies can perform the best. The success of the company is not determined by choosing a certain type of strategy, but by creating and maintaining a systematic strategy that takes in to account the environment of the company, technology and the structure of the company. When analyzing which strategy from Miles and Snow would be the most appropriate for C2C, the prospector might be very interested in C2C. Prospectors are flexible and pro-active, so new opportunities are easily adopted and implemented. Defenders are probably not very quick in adopting new concepts like C2C, but are focused on efficiency and continuous improvement, so they might be interested in adopting C2C as well, although they might take more time to decide about this.

3.2.3 – Similarities

When comparing the theory of Porter on the one hand and the theory of Miles and Snow on the other, some similarities are found. The prospector of Miles and Snow is more or less comparable with the differentiation strategy of Porter, while the defender is comparable with the cost-leader strategy. Analyzers are both working on cost-leadership and product-differentiation, but on a smaller niche of the market, so they can to some extent be compared with the focus strategy of Porter, although the analyzers from Miles and Snow are more characterized as smaller, risk-avoiding organizations following the movements of the bigger companies, while the focus-companies from Porter are described as organizations that are aiming at a specific niche-market in which they are specialized, being less depended on the choices of the bigger companies in the market than the analyzers.

3.3 Resource based view and dynamic capabilities

In the previous paragraphs is described how different strategies can benefit from C2C. However, the theories from Porter and Miles and Snow are externally focused, while it is also important to have a focus on the internal aspects, like the resources and capabilities of the company. Two perspectives on this are the resource based view and the dynamic capabilities approach.

The Resource Based View

The Resource Based View focuses on heterogeneity, which means that different firms in the same industry can perform different. This is, according to this theory, mainly because of the resources and capabilities that the company uses. Each firm has a unique set of resources, both tangible and intangible, and capabilities. Tangible resources are for example land, buildings, materials and money. Intangible resources can be divided in relational resources and competencies (De Wit and Meyer, 1998). Relational resources are relationships (contracts) and reputation (brands). Competencies are attitude, knowledge (patents) and capabilities. Resources and capabilities are a source of direction and the basis for corporate profitability. The resources influence the competitive advantage and the attractiveness of the industry. However, the company is more important than the industry in formulating the strategy. The Resource Based View states that companies can generate profit by having unique and superior assets. These assets should be protected against distribution in the industry by some kind of isolation-tool.

Grant (1991) designed a framework for the Resource Based View in which a five-stage procedure for strategy formulation is given. Strategy can be formulated by analyzing the firm's resources, identifying the firm's capabilities, analyze the profit-earning potential of these resources and capabilities, selecting a strategy and extending and upgrading the used resources and capabilities. In the third stage, where the competitive advantage of the company's resources is analyzed, also the VRIO-framework from Barney can be used (1997). Barney states that there are two important issues in analyzing the advantage of resources and capabilities, which are the homogeneity and mobility. These two issues are analyzed in the VRIO-framework, where four questions are asked: is it valuable, is it rare, is it inimitable, is it organized? When the resources are valuable and rare, costly to initiate and exploited by the company, they are very strong resources.

Dynamic Capabilities Framework

According to the Dynamic Capabilities Framework, the Resource Based View had to be extended with an answer on the reasons why companies can have a competitive advantage in the situation of a dynamic market. In a market in which the situation changes very fast and which is unpredictable, the source for competitive advantage is derived from a combination of competencies and capabilities. Teece et al. (1997) define dynamic capabilities as '*the firm's ability to integrate, built and reconfigure internal and external competences to address rapidly changing environments*'. Dynamic capabilities are related to organizational learning and strategic routines. According to Teece et al. competitive advantages are found in the managerial and organizational processes, shaped by its asset position and the paths available. The managerial and organizational processes are focused on coordination and integration, learning and reconfiguration. Coordination is achieved by integrating activities in and outside the firm. Learning

is done by repetition and experimenting. By being a learning organization the company can perform better. Organizational and individual learning are combined and result in routines. The reconfiguration processes result in a constant surveillance of markets and technologies.

The position of the company in regard to its specific assets is important to analyze where the competitive advantages lies. There are many specific assets that the company has to analyze, such as technological assets, financial assets and markets assets. Also assets as reputation and organizational structure should be taken into account. When the company has a clear view on its specific assets, it can analyze its main competitive advantages.

The available paths towards the competitive advantages can be divided in dependencies and technological opportunities. Dependencies are for example previous investments that constrain future behavior.

Similarities with strategies Porter and Miles & Snow

When applying the theory on resources and capabilities to the three strategic possibilities from the previous paragraphs, one may assume that defenders/cost leaders will have resources and capabilities related to cost control and efficient production processes. Prospectors/differentiators will probably have resources and capabilities related to R&D and innovation management processes. Analyzers will probably wait and see if they could copy resources and capabilities from these other two categories.

When a company wants to adopt C2C, it has to realize that this is a very pro-active and dynamic concept, which needs an organizational environment that can handle these needs. The production process often needs to be redesigned, which requires dynamic capabilities on the technical level. Also on intangible resources such as knowledge needs to be well-developed. When the company has the right resources to adopt C2C, C2C will help the company in making its resources even more valuable, rare and hard to imitate. C2C can contribute to this and therefore will result in stronger competitive advantages, which may lead to better financial performance.

3.4 Alignment

When analyzing the way in which strategy can bring together the stakeholders' wishes and the organizational characteristics and processes, it is important to analyze how this alignment is achieved. Therefore the alignment between the stakeholders' wishes and the organizational characteristics is analyzed in this paragraph.

3.4.1 - Backgrounds

Fortuin (2006) defines strategic alignment as '*finding the balance between the relevant contingencies in the business environment (external fit) and the firm's internal resources, competencies and capabilities (internal fit)*'. Fit is seen as a fundamental element of strategic management. According to Venkatraman and Camillus (1984), one of the reasons for this is the fact that the field of business policy is rooted in the concept of aligning organizational resources with the opportunities and threats of the environment. Another reason is that the strategic management theory consists of many concepts and research methods that are derived from related disciplines in which the concept of alignment has a dominant position (Venkatraman and Camillus, 1984).

According to Zajac et al (2000), the strategic alignment paradigm assumes a close and consistent linkage between the firm's strategy and the context in which it is implemented. A fit must be created between company strategy and the stakeholder environment. The concept of strategic alignment has played an important role in the development of strategic management thought. A widely shared assumption in strategy literature is that the appropriateness of the firm's strategy can be defined in terms of alignment of its strategy with both its internal and external detachments.

In relation to the previous paragraph where the resource based view and the dynamic capabilities approach was analyzed, Fortuin (2006) states that strategic alignment, which can lead to competitive advantage, should be considered as a capability in itself. It can even be considered

as a dynamic capability, because strategic alignment is not a temporary event, but a process of continuous change.

Venkatraman and Camillus (1984) distinguish two ways in which theories about strategic alignment can be classified. The first one is the *domain* of the fit, which is also called the strategic perspective, the second one the focus, also called the *concept*. The concept-dimension is more focused on theoretical issues while the domain-dimension is interesting for managerial issues. The domain has three categories, which can be outside-in, inside-out or an integrated perspective. The focus can be on what should be aligned, the content, or on what actions should be taken to achieve the alignment, the processes. Content-oriented theories see strategy as one of the areas that have to be aligned with other areas like the structure of the company or the stakeholder environment. Process-oriented theories see strategic alignment as a dynamic pattern of interactions between the company and its environment.

When analyzing the different theories about fit, this study is more focused on the integrated domain, so both inside-out and outside-in. The concept of the fit is in this chapter more aimed at the process approach; the view of '*strategic alignment as a continuous pattern of interactions aimed at achieving a dynamic match between the organization and its environment*' (Fortuin, 2006). In this chapter strategy is seen as the way in which the company deals with its stakeholders. However, in relation with the other organizational levels, discussed in the next chapter, the focus is more on the content of fit; the relation between strategy and the organizational structure and processes.

3.4.2 - Fit in a C2C company

When the company adopts C2C, this concept needs to fit in the relation of the company with its environment, which would fit in the integrated formulation-implementation school, but also in the whole company, on all levels, which would fit in the overarching 'gestalt' school, where fit is a dynamic process (Camillus and Venkatraman, 1984). The internal fit relates to the fact that all managerial levels need to support C2C, the external fit relates to the fact that the stakeholders should support C2C.

External fit

C2C assists in aligning strategy and stakeholder wishes because of its focus on the different groups of stakeholders and their different interests. Because companies need to redesign production processes or products when they adopt C2C, they are forced to think about the way in which they can design it in such a way that it can fit in the stakeholders interests. In the next paragraph of this chapter stakeholders are studied. Examples of how C2C can contribute to the different stakeholders' interests are given in § 2.6.

Internal fit

Fit within the company, between the three different managerial levels, is needed in a company that adopts C2C, because C2C needs to be supported through the whole company. On the strategic level, managers need to be convinced about the possibilities of C2C. On the organizational level the adoption of C2C needs to be supported by, for example, the R&D and the marketing department. On the process-level C2C needs to be made possible, in the redesigned production-processes.

Concluding, C2C helps to align stakeholders' wishes and the company's strategy, but also needs an environment where the different managerial levels are strongly aligned. Therefore, the integrated domain of fit is the most suitable for a C2C company.

3.5 – Stakeholders

In this thesis stakeholder management is seen as an important part of the strategy of the company. Therefore, theory about stakeholders will be discussed in this chapter. There are many theories on stakeholders, so in this paragraph will be focused on the categorization of stakeholders, the influence of stakeholders on the environmental awareness of companies and how C2C meets the stakeholders' interests.

3.5.1 – Definition and history

A *stake* is an interest, right or ownership of a particular person or group (Carroll, 1992). *Stakeholders* are those people and groups that affect, directly or indirectly, or are, directly or indirectly, affected by the decisions, policies and operations of a company (Freeman, 1984). The relation between stakeholders and companies is changed over the last decennia from the so-called 'three-legged stool', which was focused on only employees, customers and investors, to a complex environment where more and more stakeholders influence the decisions and performance of the company (Post et al, 2002). It is therefore important for companies to have a well-functioning stakeholder management. This management system can be focused on all the stakeholders that are affected by the companies decisions, the so-called 'ethical stakeholder management approach' (Heene, 2002). This approach got more attention during the rise of attention for CSR and sustainability, but is very complex because of the enormous amount of stakeholders. Another approach is to focus only on the most influencing stakeholders, which Heene (2002) refers to as 'instrumental stakeholder management'.

3.5.2 – Categorization

When deciding how to manage the stakeholder relations, it is important to categorize them, because not every stakeholder is of equal importance for the company. A first distinction that can be made is between primary and secondary stakeholders (Clarkson, 1995). Primary stakeholders are stakeholders that have a direct influence or are directly influenced by the company, for example employees, shareholders, suppliers and customers. Secondary stakeholders are the stakeholders that are more indirectly influencing or influenced by the company, such as government, media and activist groups. Obviously every company has an almost unlimited amount of stakeholders, when one take into account all the secondary stakeholders. The main question in stakeholder management is therefore how to decide which stakeholder is paid attention to and which stakeholder is of less importance. It is not possible to pay attention to all the company's stakeholders, so the main focus must be on the topics and issues that relate to the business activities the most. Above this, the company should ask itself if the business activities have negative impact on the society. The people and groups that are affected by these activities can be considered as the most important stakeholders (Porter and Kramer, 2006).

Two theories about categorizing stakeholders will be discussed; the power/interest-matrix of Mendelow and the stakeholder-model of Bryson.

Mendelow

In the power/interest matrix of Mendelow stakeholders are divided by the influence they have on the company (power) and how much they care about what the company is doing (interest) (Mendelow, 1981). According to Mendelow the power of external stakeholders is mainly caused by their control over strategic resources, knowledge and skills of the company. Interest can be measured by the possible reaction of a specific stakeholder on a specific strategy. The stakeholders' interests can be categorized in different categories, of which the most important are material, political and social, interests (Desmidt and Heene, 2005). In table 3.2 the four possible combinations in the power/interest matrix of Mendelow are given.

Table 3.2 – Stakeholder-model Mendelow (from: Mendelow, 1981)

	Low interest	High interest
High power	Keep satisfied	Key players
Low power	Minimal effort	Keep informed

As one can see, the matrix indicates the way in which the company should deal with each category of stakeholders. The most important category is the key players. This is the category with a high level of interest and power. It is obvious that this category should be kept in mind when defining new strategy and evaluating existing strategy. The stakeholders in the category high power / low level of interest are the most difficult category to deal with. The stakeholders in this category are usual relatively passive, but have the power to affect the company and influence the strategy on specific events. It is therefore very important to keep these stakeholders satisfied and to consider the possible reactions of these stakeholders on new management strategies. It has to be avoided that these stakeholders are more interested than the company expected, and the stakeholder from this category join the stakeholders of the category 'key players'. The stakeholders in the category low power/high level of interest should be kept informed. These stakeholders can be used as allies to convince the more powerful stakeholders. The stakeholders with low power and a low level of interest are the category that requires minimal effort.

Bryson

Another approach to categorize stakeholders is the stakeholder-model from Bryson. The main question in this model is in which way the company can prepare for possible incidents that may occur, and how the company should react and communicate if they occur (Bryson, 1988). Bryson classifies stakeholders according to their importance for the company and according to their attitude in favor or against certain decisions. The categories that are derived from this classification are presented in table 3.3.

Table 3.3 – Stakeholder-model Bryson (from: Bryson, 1988)

	Less important	Very important
Against	Problematic	Antagonist
Pro	Low priority	Supporter

The antagonists are against a certain decision of the company and of great importance for the company. To deal with these stakeholders the company should consider trying to make coalitions with the neutral stakeholders in the two 'less important' categories or at least to avoid potential coalitions between antagonists and the neutral stakeholders. It must be avoided that the antagonists convince the supporters of their attitude. Communication is very important; the company should decide which stakeholders that are between supporter and antagonists should be communicated with in which way and anticipate on possible arguments of antagonists.

Potential supporters are very important to the company and will support certain decisions. Bryson distinguish four ways to deal with supporters; the company can give them new information to convince them in their opinion, other supporters can be involved in discussions of the strategic team, where supporters can defend and promote the new ideas in discussions with neutral stakeholders and potential supporters should be asked for their opinion about new strategies, so that this opinion can be included in the strategy. By doing this, they might become supporters.

Reflecting on both models, it can be concluded that stakeholders can influence the company in different ways. The behavior and strategy of the company are dependent of the behavior of the stakeholders. The higher the level of influence from the stakeholder, and the more ways of influence are used, the more the company should be willing to cooperate with the stakeholders.

3.5.2 – Stakeholder influence on environmental measures

Madsen and Ulhoi (2000) analyzed the perceived influence of stakeholders on the environmental measures taken by companies. Companies can have several reasons to implement environmental measures, such as legislation, in which the stakeholder category government is involved, or creating a positive image, where amongst others the customers and environmental interest groups are involved. Also cost-savings can play an important role, which will be important for the shareholders. In the research of Madsen and Ulhoi companies were asked from which stakeholders they perceived the most influence. It was remarkable that most companies perceived regulation from government as the most influencing category. In their research three groups of stakeholders were distinguished, one with limited influence, one with direct influence

and one with indirect influence. The first group, with limited influence, represented secondary and external stakeholders. This group tries to influence companies through lobbying and boycotts. The second group, with direct influence, is representing governmental institutes and shareholders, and to a lesser extent also customers. The third group, with indirect influence, consists of a mix of primary and secondary stakeholders, merely customers and competitors. The result that regulating governmental institutes were seen as the most influencing stakeholders is important, although not very surprising. For decades the government was the main reason for companies to implement environmental measures. More surprising outcome of the research of Madsen and Ulhoi is the relative low rate of perceived influence from environmental interest groups, suppliers and even customers. These stakeholder-groups are regarded as groups with little influence. On the other hand, these groups are relatively easy to reach or communicate with. When these groups are placed in the stakeholder-matrix of Mendelow, this would be the groups with low power but average till high interest. This can be an important category in decisions about stakeholder management, but also in decision about environmental measures.

The influence of stakeholders on environmental decisions of the company is also described by Polonsky and Ottman (1998). They state that in particular the role of the consumer is of great importance. In their research they therefore focus on the role of the marketer in implementing environmental management. Real effective environmental improvements are only possible when marketers and/or the top level management analyze the environmental impact of their business activities before the products are designed or modified. However, often the marketer or the responsible manager for environmental measures has not sufficient or not at all knowledge of environmental impacts of the business activities. Also their knowledge of environmental friendly alternatives for products or materials they use is often very limited, which amongst others has to do with the fact that environmental issues are not the core issues for companies. It is therefore important to involve people with more experience. Polonsky and Ottman recommend that external stakeholders should be involved in the design process of new products, to give extra input about environmental issues related to the product. Environmental interest groups could be very useful for this purpose. Environmental groups could, according to Bremmers et al, better focus on micro-level instead of on the macro-level. These kinds of interest-groups often have a lot of knowledge on environmental issues and measures, but they are not regarded as having much influence on the company (Bremmers et al, 2006; Madsen and Ulhoi, 2000). Besides the technological knowledge these groups also have insight in the recent developments in the environmental area. Of course, also stakeholder categories like customers and suppliers should be involved. In the past, many 'environmental friendly' new products did not succeed in the market, amongst others because of the lack of extra value for the consumer. The involvement of extra stakeholders in formulating environmental strategies of the company makes it possible to take into regard all relevant environmental issues. However, it makes the production-process and the product-development much more complex. Companies should make a balanced decision about the amount of stakeholder-influence they want to involve and which stakeholders are the most appropriate for the kind of involvement they want. In deciding this, also the size of the company plays an important role.

Madsen and Ulhoi (2000) formulated a stakeholder model in which the influence of the stakeholder is categorized as opportunity or as threat, according to the SWOT-analyze, and further distinguished to primary and secondary stakeholders. This stakeholder model, the SPOT-model (secondary, primary, opportunity, threat-model), is a theoretical model that can be used to recognize the influence of different groups of stakeholders. The research of Madsen and Ulhoi showed that environmental conscious companies are often also more consciousness of their stakeholder relations. Each time such a company acts, the most important stakeholders react, until a new balance is found in which the different interests of the stakeholders and the company are met. According to Madsen and Ulhoi (2000) companies often have a reactive attitude in this, they react to the stakeholders wishes at the moment these stakeholders react. Polonsky and Ottman (1998) however promote a more pro-active approach in managing stakeholder relationships, by involving stakeholders in the decision-making process regarding environmental issues and product-design. By following this approach, the ideas still come from the stakeholders, but these ideas are directly taken into account in the production-process, instead of getting

reactions and feedback backwards. Listening to the wishes of stakeholders when the process is already started is reactive; involving stakeholders in the process is a pro-active approach. In a pro-active approach it is easier to make environmental changes and find effective solutions for future environmental problems.

Thus, according to Polonsky and Ottman (1998), to achieve environmental changes, it is important that the stakeholders are integrated in the development processes, which can be done by using an adopting or cooperative approach (Polonsky, 1995). To reach a cooperative and integrated relation between company and stakeholders, stakeholders should not be seen as only an external force, but as a part of the organizational process. This cooperative approach can result in benefits for both the company and the stakeholders. It is important to have an open dialogue and communication structure between the stakeholders and the company. Both Madsen and Ulhoi (2000) and Polonsky and Ottman (1998) state that it is of great importance to create an open attitude between stakeholders and company. Also Bremmers et al (2006) mention that an open attitude and a pro-active approach are important. They state that when initiating environmental management initiatives, different parties should be involved, amongst which two external stakeholders, namely environmental interest groups and governments. As is mentioned before, Bremmers et al advise environmental interest groups to switch their focus from the macro-level to the micro-level. Governments should act the opposite; they need to change their focus from firm-level to supply-chain-level. Involving stakeholders in the development and production-process of the company is of great importance, which goes beyond asking stakeholders their opinion only when problems occur.

3.5.3 – Stakeholder influence on the cradle-to-cradle methodology

The influence of stakeholders on environmental awareness is described in the previous part of this paragraph. In this thesis it is important to focus on how the stakeholders may influence the adoption of C2C. In chapter two, C2C is compared with existing environmental management systems. It showed that C2C can be compared with pro-active, waste-preventing environmental measures (McDonough and Braungart 1998, 2007, Van Koppen and Hagelaar, 2005). Current environmental measures that are aiming at preventing environmental harm are often comparable with parts of C2C. The way in which stakeholders influence the environmental awareness of companies is therefore in some way comparable for the way in which the stakeholders can make the company aware of C2C. Stakeholder influence on environmental awareness was found in the perceived image of the company, mainly by the consumers, but also by environmental interest groups, who inform the consumers. This also holds for C2C. At this moment, C2C is getting more and more media-attention, and more and more people are becoming familiar with the concept. Companies can show their efforts concerning C2C by getting C2C certified (McDonough and Braungart, 2007) or by promoting their C2C efforts in the media. The C2C principles provide a platform for shared leadership and collaboration amongst a range of stakeholders, such as suppliers, manufacturers, dismantlers, government agencies, educational institutes and non-governmental organizations, involved in realizing integrated systems of design, manufacturing and material recovery (McDonough, 2004).

The main difference with other environmental measures is that C2C is something that manifests itself in all parts of the production-process. Involving stakeholders in every step of the production process is of course very complex, so it is not quite clear if this is possible for C2C. However, it is possible to involve different stakeholders in the different steps. When stakeholders are involved in other environmental management systems, this is also done. For example, consumers can be involved in the decision what products should be made, environmental groups in the design phase and the development of the production process, governmental institutes in the legal and safety part of the process and shareholders in the decision about whether or not to invest in new products or product-modifications.

3.6 Contribution of cradle-to-cradle to stakeholder goals

C2C is described with a lot of examples in the cradle-to-cradle book of McDonough and Braungart, the founders of C2C. In many of their articles, in presentations, the media and on their website they also give examples of companies and their stakeholders that were involved in C2C projects. The amount of stakeholders that are mentioned in the book and the media, implies that C2C is adopted by many kinds of stakeholders, including competitors, NGO's, manufacturers, governmental institutes on several levels, universities and research centre's, dismantlers, waste treating companies, suppliers and customers (McDonough, 2000). In C2C it is assumed that changes to make products or production-processes according to the C2C principles one should start in the product-developing stage. In the examples found in the book and the other media, almost every C2C project was started in the development stage, either in projects in which new products were developed or in projects where existing products were redesigned according to the C2C standards. This fits in the ideas of Polonsky and Ottman (1998), as they were mentioned in the previous paragraph. These authors state that companies should make strategic alliances with stakeholders, amongst others because of the knowledge of (external) stakeholders about environmental measures and trends. Stakeholders should be involved in the developing stage, to have feedback on new products in time, and redesign in a later stage will be avoided. Also Gregory and Wellman (2001) state in their article that it is important to involve stakeholders in an early stage of the production-process. They state that there are three fundamental promises that are usually given with regard to environmental initiatives. These three promises are that the company will take into account the stakeholder wishes, good science will be used and scarce materials will be used wisely. These three promises are also present in C2C. In C2C the interests of many stakeholders play an important role. Solutions for pollution and waste-problems are found in science. Scarce materials are dealt with very carefully, because there will be search for other materials that can replace the scarce materials, or in case the scarce materials are not replaceable by other materials, the scarce material will be recycled again and again.

In practice, the existing environmental initiatives don't often meet all three promises. Therefore Gregory and Wellman (2001) promote the incorporation of these promises from the design phase onwards in the production and design process, which will result in a bigger change to reach the promised goals. The scientific input and the involvement of (local) stakeholders can be put together to make decisions that can be defended more easily and to let environmental initiatives align better with the stakeholder wishes. A structured process in which the decisions about the production-process are made and clear trade-offs between the different stakeholder wishes are of great importance for the company in developing an effective and cost-efficient environmental policy.

In the previous paragraph it was already mentioned that it is important to have an open dialogue with stakeholders. The communication-channels must be transparent. The founders of C2C also pay attention to the importance of this. They do this in one of the nine principles they formulated, known as the 'Hannover principles', which are their fundamental ideas about sustainability. In this principle they state that the company should "seek constant improvement by the sharing of knowledge and encourage direct and open communication between colleagues, patrons, manufacturers and users to link long term sustainable considerations with ethical responsibility and re-establish the integral relationship between natural processes and human activity" (McDonough and Braungart, 1992).

In C2C the *triple top line* is important (McDonough and Braungart, 2002-b). This is a triangle in which three important values are described. Each product is used and produced in an interconnected world. It is important to see the product as a part of this world, and to think about how the product fits in the triangle, which consists of the three values ecology, equity and economy. The triangle, also mentioned shortly in chapter 2, is presented

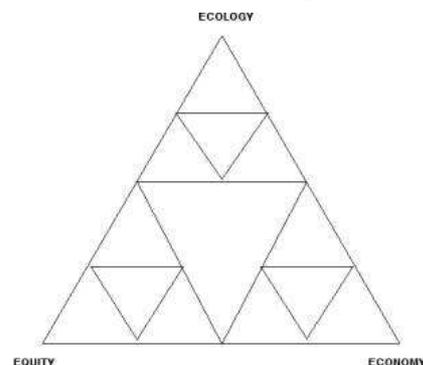


Figure 3.3 – Fractal triangle

in figure 3.3. The three key values represent the basic stakeholder wishes, which, according to McDonough and Braungart, are similar to each of the three main ideologies of the 20th century. The ecology-value represents the wishes from the stakeholders with a main interest in ecology. The economy-value represents the wishes from the stakeholders from the capitalism school of thought, as the authors describe it. The equity-value is a representation of the socialism. The economy part of the triangle focuses on the economic gain of products. The ecology value is representing the ideas of environmental interest groups and governmental institutes that reacted on the ecological consequences of the production processes. Equity is seen as the most important value by social movements. Thinking according to the triple top line means that the company searches for a way to balance between these three values. In chapter 2 these three domains are referred to as the social, the financial and the environmental area, these typologies are used besides each other.

As was described in chapter 2, each of these three areas represents different stakeholders. The financial area represents the interests of the shareholders, the social area the interests of the employees and the people in the local environment of the firm, the environmental area the interests of environmental groups and government.

C2C also focuses on the importance of the use of local resources and possibilities. This is even one of the three principles that were described in an important paper that was written by McDonough and Braungart in the period before they wrote their book about C2C; “The next industrial revolution” (McDonough and Braungart, 1998). In this article the three principles of natural design are described. The first is the ‘waste equals food’ principle, which is described in chapter two. The second principle is the use of solar energy. The third one is ‘celebrate diversity’ or ‘respect diversity’. This last one is relevant in analyzing the way in which C2C contributes to the stakeholder’s goals. According to the diversity-principle, product-designs “*will respect the regional, cultural and material uniqueness of a place*” (McDonough and Braungart, 1998, 2002). Social responsibility is used to guide the company’s operations and its stakeholder relations.

3.7 Conclusion

In this chapter theory on strategy, alignment and stakeholders is analyzed. The four related research sub-questions from § 1.2.3 are answered.

Strategy is explained using two theories, where a distinction is made between prospectors/differentiators and defenders/cost-savers. Between these two anti-poles the analyzers can be found, who are focused on a smaller niche of the market and can aim both at product-differentiation as well as cost-savings. For each of these categories different resources and capabilities are of importance. C2C often requires a redesign of the product and the production processes, which seems to be more suitable for prospectors. Also the resources and capabilities needed for C2C should be flexible, innovative and technical high-developed. On the other hand does C2C contribute to efficiency, so the defenders, who are risk-avoiding and more focused on cost-savings, might be willing to adopt C2C as well, although they might want to wait till positive examples of the influence of C2C on cost-savings are available. This provides the answer to the first research sub-question, which asked *how C2C fits in existing theories about strategy*.

When putting the conclusion upon the two different kinds of strategies that might be suited for the adoption of C2C in a schedule, this leads to figure 3.4. As was mentioned, these two strategic types are opposites. In this figure this is represented by the two arrows, pointing in different directions.

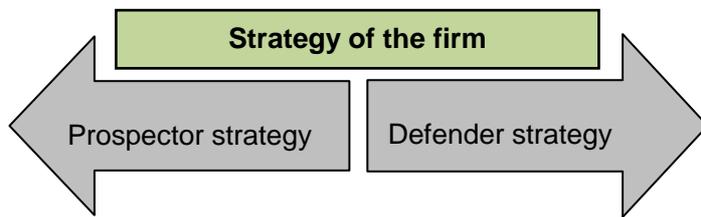


Figure 3.4 – Conclusion upon types of strategy

As was mentioned, for both types of strategies different reasons for adopting C2C are found. Companies with a prospector strategy will be more likely to adopt C2C in an early stage, because of their innovative and flexible strategy, while the risk-avoiding defenders will adopt C2C in a later stage, when possible shortcomings of C2C are detected and solved.

The second sub-question related to this chapter asked *how strategy aligns stakeholders and the organization*. Strategy aligns the stakeholders and the organization by translating the stakeholders' wishes to the organizational characteristics, taking into account its resources and capabilities. The alignment of strategy with the other organizational levels and with the (local) environment is of great importance for the company. Fit between the different managerial levels is needed for a successful implementation of C2C, because C2C should be supported on all levels. C2C assists in aligning strategy and stakeholder wishes because of its focus on the different groups of stakeholders and their different interests.

There are many different stakeholders, and many different ways to categorize them and to manage them. The ways of influence can be divided in voting power, economic power and political power. When it comes to environmental awareness, companies can have several reasons to implement environmental measures, such as legislation, in which the stakeholder category government is involved, or creating a positive image, which is important for the customers. Also cost-savings can play an important role, which will be important for the shareholders. Most companies perceive regulation from government as the most influencing category. Polonsky and Ottman (1998) recommend that external stakeholders should be involved in the design process of new products, to give extra input about environmental issues related to the product. The role of stakeholders in the environmental awareness of companies is thus found in the political power from governments, the voting power from shareholders and the economical power of consumers, who are influenced by ecological interest groups. This answers the third sub-question, about *the role of stakeholders in the environmental awareness of companies*.

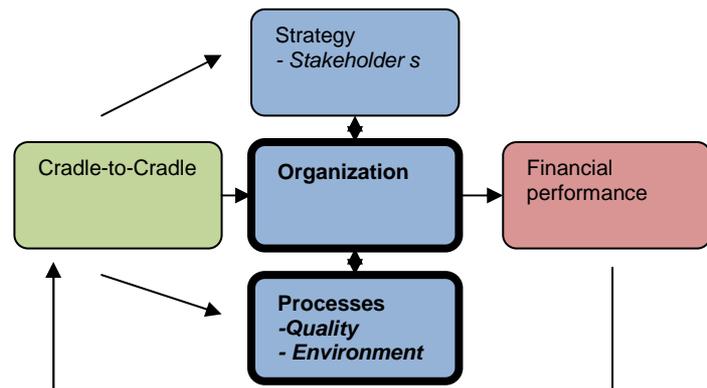
The last research sub-question that needed to be answered in this chapter asked *what contribution the cradle-to-cradle methodology makes towards stakeholder goals*. In C2C the 'triple top line' is important. This is a triangle which consists of three values; ecology, equity and economy, which are also described as an environmental, financial and social area. These three key values represent the basic stakeholder wishes. Thinking according to this principle means that the company searches for a way to balance between these three values. By doing this, C2C contributes to the stakeholders' wishes. So, C2C contributes to the stakeholder goals by stimulating the balance between the different stakeholder's interests.

Chapter 4 – Organizational characteristics and processes

This chapter is part of the literature study. In this chapter the organization and its processes are analyzed, both with a link to C2C.

4.1 Introduction

In this fourth chapter theory about organizations and processes is studied. The sub-questions formulated in chapter 1.2.3 will be answered in this chapter. The sub-questions asked how organizations can be characterized and what characteristics fit in C2C, what organizational systems are used for quality control and environmental care and how C2C contributes to the environmental management. The organizational characteristics of firms are analyzed by Mintzberg's (1979) theory about the structuring of organizations (§ 4.2). This is followed by an analysis of how the environmental management of the organization can be controlled on the tactical level (§ 4.3). Then the processes of the company are analyzed. This is done by an analysis of quality control systems (§ 4.4.1) and environmental care systems (§ 4.4.2). The way in which C2C contributes to the environmental management of organizations is studied (§ 4.4.3). This chapter ends with a conclusion, in which the answers on the sub-questions will be extracted and summarized from the theory (§ 4.5).



4.2 Organizational characteristics

As was stated in the previous chapter, in management literature the company is often divided in three parts; the strategic level, the organizational level and the operational level. In this paragraph is focused on the organizational level. The organizational characteristics are not only the way in which the company operates or how it places itself in the market, but also the structure of the company. This includes a broad range of issues, such as the way in which the company is managed, the decision-making process and the translation of the mission and vision of the company to the work floor. The focus of the organization can be on the product, the market or the geographical location of the company, which has its influence on the structure of the company as well. When structuring the organization, the classical approach of structuring in line-organizations, line-staff organizations and matrix-organizations is well-known.

It is important to know how a company is structured, especially for decisions on the organizational level, but also to see which structures are open for innovations. In this thesis is decided to use the theory from Mintzberg to analyze the structuring of organizations. Mintzberg gives a clear overview of both the different characteristics of the firm that influence its structure and the different configurations that can be distinguished as result of the different structuring of these characteristics.

As one of the leading authors in the area of organizational studies, Mintzberg developed a synthesis of existing theories about the structuring of organizations in his study *'The structuring of organizations'* (Mintzberg, 1979). With the configurations Mintzberg described is analyzed which organizational structure fits best in C2C.

4.2.1 - Characteristics of the organization

The structure of the organization is dependent on different aspects. Mintzberg distinguishes four different areas that influence the structure of the organization. These are the basic characteristics of the company, the coordination mechanisms, the design parameters and the situational factors. Each four of these influences is described shortly.

Basic characteristics

In the framework of Mintzberg, the company consists of six basic characteristics. These are the strategic top, the middle line, the operating core, the technostructure, the supporting staff and the ideology. The strategic top is the place where the top managers direct the company. The middle line management communicates the ideas of the top management to the operating core, where the basic work of the primary process is done. To make this work, there is the supporting staff, which provides everything that is needed outside the operating workflow, such as administration, PR and marketing and the R&D-department, and the technostructural staff, which assists in making the production process technical possible by controlling and planning the processes. The sixth part of the framework is the ideology, which consists of the mission, vision and traditions of the company. In figure 4.1 this is graphically represented.

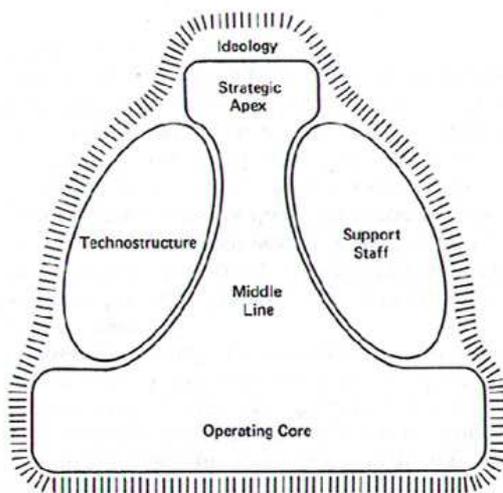


Figure 4.1 – Mintzberg’s six basic parts of the organization

According to the type of company, more or less attention is paid to each of these characteristics.

Coordination mechanisms

Mintzberg distinguishes six ways in which the work in the organization can be coordinated. The company can be coordinated in an ad hoc nature, like direct supervision or mutual adjustment. Direct supervision means that the management decides what should be done, which is carried out by the employees. Mutual adjustment means that the work is coordinated in an informal way, by adjusting the work amongst each other by the interaction of the employees. In a more standardized way the work can be coordinated by standardization of work processes, standardization of outputs, standardization of skills or standardization of norms. In table 4.1 an overview is given of how the coordination in each mechanism is done.

Table 4.1 –Overview coordination mechanisms Mintzberg

Coordination mechanism	Coordination through:
Mutual adjustment	Informal communication
Direct supervision	One person takes responsibility
Standardization of skills	Specified and standardized training and education
Standardization of work processes	Specifying the work content in rules or routines
Standardization of output	Communication and clarification of expected results
Standardization of norms	Common values and beliefs

Design parameters

The third influence on the structuring of organizations are the design parameters. The design parameters of a company help dividing labor and coordination. The most important design parameters that Mintzberg distinguish are the function specification, which deals with the amount

of tasks and responsibilities per function; the size of departments or groups; the degree of horizontal and vertical (de)centralization and behavior formalization.

Situational factors

The fourth influence are the situational factors. Mintzberg describes three categories of situational factors; the technical system, the local environment and the age and size of the company. The technical system can vary from complex till simple. The local environment of the organization can vary from dynamic till stable. The age and size of the company vary from young and small till mature and big.

4.2.2 - Organizational configurations

With the four influences from § 4.2.1 Mintzberg comes to several configurations of organizational structures. The five most important configurations are described in table 4.2. In this table the main differences between the configurations are described according to most important characteristics, the coordination mechanisms, the design parameters and the situational factors.

Table 4.2 –Overview organizational characteristics of Mintzberg's configurations

Configuration:	Main characteristic	Coordination mechanism	Design parameters	Situational factors
Simple structure	Strategic top	Direct supervision	Centralized structure	Young and small company, simple and dynamic environment
Machine bureaucracy	Technostructural staff	Standardized work processes	Formalized behavior, decentralization	Old and large company, simple and stable environment
Professional bureaucracy	Operating core	Standardized skills	Horizontal decentralization	Simple technological system, complex and stable environment
Divisionalized form	Middle management	Standardized output	Limited vertical decentralization	Old and very large company, simple and stable environment
Organic structure	Supporting staff	Mutual adjustment	Selective decentralization	Young company, complex and dynamic market, sophisticated technological system

It is important to realize that there is not one structure which can be considered as the best structure for all companies. Per company it may differ which kind of structure is the best. There are different ways to success, which means that not every company will perform optimal in the same way. Each of these configurations has its strong and weak points, which are amongst others dependent of the influences of the environment of the organization and the business goals of the company. In practice, it is hard to categorize a company in only one of the basic-configurations, because there are often characteristics of multiple configurations present in each company. Nevertheless, it is important to analyze which configuration suits the company the best, because this can be used to get an impression of the strong and weak sides of the company, and it makes it possible to compare the company with other organizations.

4.2.3 - Configurations and cradle-to-cradle

When analyzing which organizational structure fits in C2C, it is important to make a distinction in the four different areas that Mintzberg identified as main characteristics for the structure of the organization. C2C is compared to each of them in the following tables. The part that fit most in C2C is mentioned, followed by a short explanation. This explanation is done by the key element of C2C that fits with these options. After each table this key element is explained a little more extensively, although one might need the backgrounds from chapter three.

Table 4.3 – Overview basic parts of the organization that fit in cradle-to-cradle concept

Basic part of the organization		
<i>Parts fit in C2C</i>	<i>Key C2C element</i>	<i>Source</i>
Technostructure	Biological & technological cycles	McDonough&Braungart, 2002
Supporting staff	Redesign of facilities	McDonough&Braungart, 2002b

When deciding which part of the organization is the most important for the company, according to C2C, two parts emerge: the technostructure and the supporting staff. When an organization wants to adopt C2C, the facilities to work with the concept needs to be redesigned. The work should be planned and organized in a new way, with extra attention to the C2C principles. This is something where the technostructure of the organization is important. The product also needs to be redesigned in such a way that all its materials can return in a biological or technological cycle. The research for this redesign will be done by the R&D-department, which is a part of the supporting staff.

When analyzing which organizational structure has the most in common with C2C, the focus will be on structures with an extensive technostructure and/or supporting staff. These are the machine bureaucracy and the organic structure.

Table 4.4 – Overview coordination mechanisms that fit in cradle-to-cradle concept

Coordination mechanism		
<i>Parts fit in C2C</i>	<i>Key C2C element</i>	<i>Source</i>
Standardization of output	Selling Intelligence	McDonough&Braungart, 1998
Mutual adjustment	Respect diversity	McDonough&Braungart, 2002

Two of the coordination mechanisms Mintzberg distinguished appear to have something in common with C2C. C2C talks about ‘selling intelligence’ as an important goal of the company, which means that instead of selling a product, the company needs to sell a service that meets the customers’ demands. For example, instead of selling a printing machine, a company can decide to sell the possibility to print. The ownership of the product remains with the producer, so he can take care of the recycling of the machine. When this intelligence is seen as the standardized output, this is an important coordination mechanism in a C2C organization structure. On the other hand mutual adjustment has much in common with C2C. Every part of the company should be involved in finding new C2C possibilities, because in the ideal situation all aspects of the product, and of the process, needs to be C2C. Every department has his own special view on making the processes more C2C, which is referred to in C2C literature as ‘*respect diversity*’. Configurations that have these coordination mechanisms are the divisionalized form and organic structure. Taking into account that the standardization is not very flexible and therefore might have a negative influence on the efficient adoption of C2C, the coordination focused on mutual agreement is preferred, which supports the organic structure.

Table 4.5 – Overview design parameters that fit in cradle-to-cradle concept

Design parameter		
<i>Parts fit in C2C</i>	<i>Key C2C element</i>	<i>Source</i>
Decentralization	Respect diversity	McDonough&Braungart, 2002

It is not very clear what kind of design parameters fit best in C2C, although the C2C literature seems to prefer decentralized structures. This has to do with the diversity that C2C encourages. All organizational levels should support the C2C ideas, and the ideas and suggestions for improvement from the work-floor should be noticed. After all, the redesign must be made possible on the lower levels. Almost all configurations support a certain degree of decentralization, except for the entrepreneurial configuration. The machine bureaucracy seems to have the most attention for decentralization.

Table 4.6 – Overview situational factors that fit in cradle-to-cradle concept

Situational factors		
<i>Parts fit in C2C</i>	<i>Key C2C element</i>	<i>Source</i>
Technical complex	Redesign the product	McDonough & Braungart, 2002
Dynamic market	Intelligent materials pooling	McDonough, Braungart & Bollinger, 2006

In a C2C company the consumers needs to be open-minded for new products, or actually redesigned products. The product may look different because it is designed in a C2C way, and it may be delivered in another way. Also other parties in the supply chain needs to be willing to change their business as well, in the C2C literature described in for example the intelligent materials pooling concept. Intelligent materials pooling is a framework to pool material resources and specialized knowledge, which results in a system of cooperation amongst all actors along the supply chain. So the environment of the company that implement C2C should be very dynamic. All the changes because of the redesign of the product imply a complex and innovative technical system.

When comparing the elements that are selected above with the five different configurations, it becomes clear which configuration fits most in C2C. In table 4.7 these elements are mentioned once more, in a matrix with the five configurations. When the configuration meets the selected elements, this is mentioned by a '+'-symbol.

Table 4.7 –Overview Mintzberg's configurations and C2C characteristics

	Main characteristic		Coordination mechanism		Design parameter	Situational factors	
	Techno-structure	Supporting staff	Mutual adjustment	Standardized output	Decentralized	Complex technology	Dynamic market
Configuration:							
Simple structure	-		-		-		-
Machine bureaucracy	+		-		+		+/-
Professional bureaucracy	-		-		+/-		+/-
Divisionalized form	-		+		+/-		-
Organic structure	+		+		+		+

From this matrix follows that two structures meet two or more of the C2C characteristics; the machine bureaucracy and the organic structure. The machine bureaucracy has a strong technostructure, which might help the company in developing the often very complex technical adjustments in the production process when C2C is adopted. The design parameter is partly aimed at decentralization, which also meets the C2C criteria. However, the coordination mechanism focuses on standardization of the work processes, which does not fit in the flexible way in which decisions needs to be made in C2C. The other organizational structure is the organic structure. The organic structure fits in C2C in all four aspects. The supporting staff has an important role, the coordination mechanism is mutual adjustment and there is a selective decentralization. The situational factors are a complex and dynamic market, and a sophisticated technological system. In table 4.8 the characteristics of the organic structure and the machine bureaucracy that fit in the C2C characteristics are given.

Table 4.8 - Overview characteristics of configurations that fit in cradle-to-cradle concept

Configuration:	Main characteristic	Coordination mechanism	Design parameters	Situational factors
Organic structure	Supporting staff	Mutual adjustment	Selective decentralization	Complex and dynamic market, sophisticated technological system
Machine bureaucracy	Techno-structure		Decentralization	Complex technology

When analyzing which of Mintzberg's organizational types fits the most in C2C, the organic structure and the machine bureaucracy show to have the most similarities with C2C. However, these two configurations are more or less opposites, because they fit in C2C on several different aspects. This is also made clear by Miller (1986), who states that the machine bureaucracy has an emphasis on efficiency, which fit in a stable setting. The machine bureaucracy is inflexible and focused on cost leadership, while the organic structure is an innovative and flexible structure, with a focus on differentiation. In table 4.9 the main differences are given.

Table 4.9 - Overview differences of configurations that fit in cradle-to-cradle concept

Configuration:	Strategy	Marketing emphasis	Production emphasis	Innovation and R&D
Organic structure	Differentiation	New products, High quality	Flexibility	Very much
Machine bureaucracy	Cost leadership	Low price	Efficiency	Almost none

In the previous chapter different strategic types of organizations were mentioned, also opposites from each other, like the defenders and prospectors (Miles and Snow) or cost-savers and differentiators (Porter). As is shown in table 4.9, the organic structure fits in the differentiation or prospector classification, while the machine bureaucracy fits in the defender and cost-leader classification. Both types are suited for C2C, although from a different perspective. The kind of companies that would be the most likely to be the first to adopt C2C will be the organic structure, because they have the flexibility and the innovativeness to adopt new concepts in an early stage. The machine bureaucracy will be more likely to adopt it when all possible risks are made clear and when it is clear that it can lead to cost-savings.

4.2.4 – Concluding remarks configurations

The organic structure is the most innovative organization that Mintzberg describes. Important difference with the other organizational structures of Mintzberg is the fact that the technostructure and the supporting staff are not seen as two separate parts, standing more or less beside the company, but as integrated parts of the company. The machine bureaucracy is not as flexible as the organic structure, but has a strong technological staff that is searching for innovations, although they need more certainties before implementing innovations. Therefore environmental innovations, often quite uncertain, will be implemented in a later stage, when uncertainties are eliminated.

4.3 Organizational processes - systems for quality control and environmental care

The structure of organizations is important when analyzing which kind of organizations may adopt C2C, and to analyze in which structures it might fit the best. However, besides the organizational structure of the company, also the process-level needs to be analyzed, where for example control mechanisms that are already present in the company are important. Most companies have implemented some kind of quality control mechanism to monitor the quality of their products. It is important to see how this is done, and what place environmental issues have in these quality control systems.

Closer related to C2C are the environmental control systems that companies may use. In this paragraph, the focus will be on quality control and environmental care systems. There will be given background information about some of the most important quality-models and environmental care models. Also Life Cycle Assessments (LCA) will be discussed shortly.

4.4.1 - Systems for quality control

There are many ways in which the company can control the quality of its products. Some well-known examples of quality control are the EFQM/INK-model, ISO-9000 and Total Quality Management.

EFQM / INK management model

The INK-model is the Dutch version of the EFQM-model (European Foundation for Quality Management). INK, which stands for 'Instituut Nederlandse Kwaliteit', aims to stimulate Dutch companies to work on 'Total Quality'. The INK-model describes four result-areas and five enablers (organization-areas). The result areas are people satisfaction, customer satisfaction, impact on society and key performance results. The enablers are leadership, policy and strategy, people management, resources and processes. These nine areas are determining the success of a company. The enablers make it possible for the company to score on the result-areas. The result areas are the area for attention on which the performance of the company can be measured, for example with the use of performance-indicators.

There is a feedback-loop from the result areas to the enablers. By defining and measuring the performance-indicators per result area, steering information can be given to the enablers. Subsequently on this organization-level related goals can be determined, including the desired results which can be measured again in the result-areas.

The INK-model is a model which is clear and manageable and used more and more for the professionalizing of planning and control. The model classifies and combines the key-issues for the manager and helps to judge and improve the quality of the organization in a transparent way.¹ The management of processes is a separate area in the INK-model. On the one hand, it is part of the enablers in the left part of the model, but on the other hand it can also be seen as a separate field between the enablers and the results, or even more as the link between these two. The reason why the processes have such a central place in the INK-model is because it brings the enablers and the results together and because it shows the identity of the company. The processes transform the enablers in results, so the processes have an important impact on the customers, the employees and the environment of the company (Hardjono, 2006).

ISO 9000-series

The International Standardizing Organization, ISO, has many standards. Many standards in the ISO series cover specific aspects such as vocabulary, documentation, training, and financial and economic aspects. The ISO 9000 series is concerned with quality management. This means what an organization does to enhance customer satisfaction by meeting applicable regulatory requirements and continually to improve performance in this regard. The ISO 9000 is applicable for all industries and focuses on whether the whole process of an organization is controlled, from sales to service, no matter what kind of product the company produces, what size the company has or whether the company is in the public or private sector.

¹ Source: www.efqm.org and www.ink.nl

The ISO 9000 series are international accepted standards on good quality management.¹ ISO 9000 consists of standards and guidelines related to both quality management standards and related supporting standards and provide a set of standardized requirements for quality management systems. It provides a framework for managing the organization's processes in a systematic way, so that they consistently result in products that satisfy the customers' expectations.

The ISO 9000 series present standard requirements for quality management systems, but leaves enough flexibility for the company to implement this in a way that this meets with their organizational characteristics.

There are several ways in which a company can audit its quality system when it is based on the ISO 9000 series. The company can decide to audit themselves, to measure if it controls its activities. The company can also decide to let its customers audit the quality-system. In this case the customer can give the company a good overview about how the company meets the customers' requirements. The most popular option is however, to let the ISO 9000 quality system be audited by an independent quality system certification organization. The ISO 9000 series are a standard against which the company can be certified. This is become very popular because it proves the credibility of the company's quality control. Customers do not have to control the quality of the company's products, but can rely on the certification organization. The certificate can also be used as a business reference between the company and potential new clients, especially when the company and the customer are new to each other, or far removed in a geographical way, for example when the company is exporting its products.

Total Quality Management

Total Quality Management is a process for managing quality. It is a continuous way of life, a philosophy of perpetual improvement in everything the company does. The word 'total' means that quality involves everyone and all activities in the company. The word 'quality' relates to meeting the customer requirements. 'Management' means that quality can and must be changed. Important elements of Total Quality Management are reducing the costs of products and services, just-in-time manufacturing and reducing development cycle times. The main idea of the theory is that the key to improve quality is to improve processes that define, produce and support the company's products. In the theory of TQM ten steps can be found:

1. Pursue new strategic thinking.
2. Know your customers.
3. Set true customer requirements.
4. Concentrate on prevention, not correction.
5. Reduce chronic waste.
6. Pursue a continuous improvement strategy.
7. Use structured methodology for process improvement.
8. Reduce variation.
9. Use a balanced approach.
10. Apply to all functions

In comparison with ISO9000 Total Quality Management is much broader.

Reasons for adopting these kinds of quality management models are increased efficiency, increased revenue, international recognition, supplier relationships, customer satisfaction and improvement of the processes.² Companies that implement quality certification processes get a lot of thought about their processes and how they can maximize quality and efficiency. Once certified the processes are established and guidelines in place for anyone to follow easily, making training, transitions, and trouble-shooting easier. The quality models described above are internationally recognized, so suppliers, customers and other stakeholders will know what they can expect from the company.

¹ Source: www.iso.org

² <http://biotech.about.com/od/isocertification/tp/ISOQMS.htm>

There are some elements in these quality systems that also occur in C2C. In table 4.10 some similarities are given.

Table 4.10 – Similarities quality models and C2C

	Connection to C2C	Similarity in C2C methodology
INK / EFQM	Attention for environment, employees and customers	Fractal triangle and diversity (see § 3.5)
ISO 9000 series	Certification procedures have some similarities with C2C-certification	C2C certification standards (see § 2.2.5)
TQM	Focus on new strategic thinking and on prevention instead of correction	Eco-effectiveness (see § 2.2.3)

The first step in TQM, new strategic thinking, is also needed in C2C. The fourth step in TQM is even more comparable; it states that there should be concentrated in prevention instead of correction. In C2C this is also a leading idea with respect to the environmental burden. C2C refers to this as eco-effectiveness; correcting negative consequences is not effective, preventing environmental harm is.

The ISO-certification and the C2C certification procedures have some common steps, although the ISO certification is much more extensive. The external audit mentioned in the ISO-certification is something that also is required in the C2C (platinum) certification.

The sixth, seventh and eighth step in the INK/EFQM model are focused on the results of the procedures of the company on the employees, the customers and the environment. This has some similarities with the triangle in C2C, which focuses on an economic, ecologic and social area. The focus from the INK/EFQM model on the social area (customers and employees) is a strong similarity. Of course the INK/EFQM model also focuses on the financial results, so this quality-management model has a strong resemblance with C2C.

Most important is that companies which pay attention to quality management systems might be more willing and prepared to adopt environmental management systems as well, which is analyzed in the next paragraph.

4.4.2 - Systems for environmental care

Also for environmental care there are structured systems. The structure of environmental management systems is for an important part based on the structure of quality management systems. Most environmental management system standards are based on quality management standards. Environmental management systems can be defined as “that part of the overall management system which includes organizational structure, planning activities, responsibilities, practices, processes and resources for developing, implementing, achieving, reviewing and maintaining the environmental policy”.¹ The key principles of an environmental management system are that it should be systematic, integrated and documented environmental management, with continuous improvement, compliance as the bottom-line and company policy as frame of reference.

There are many different environmental management system standards, such as PREPARE, BS7750, EMAS, ANSI/ASQC E4 and the ISO 14000 series. The most important ones are the ISO14000 series and EMAS, which will be described in this paragraph.

The ISO 14000 series

The International Standardization Organization set up the 14000 series in the 1990's. Within these series there are many standards. The most important standards are the ISO 14001 and the ISO 14004 standard. The ISO 14001 standard, entitled *'Environmental management systems – specification with guidance for user'*, contains the standard requirements for certification in the ISO 14000 series. The ISO 14004 standard, *'Environmental management systems – general guidelines on principles, systems and supporting techniques'*, contains more general guidance

¹ ISO 14001 definition from www.iso.org

and practical help related to implementing an environmental management system. The ISO 14001 standard contains five main elements, consisting of an environmental policy, planning, implementation and operation, checking and corrective action and management review. First, the company needs to have an environmental policy. This policy should stress a commitment to continuous improvement and should be supported by the management. The second element is planning. In the planning element first the most important environmental aspects are identified. This current position of the firm should be analyzed, followed by identifying the legislative requirements, which will lead to environmental targets and objectives. In an environmental program the means to reach the environmental targets should be described. After the policy and planning phase, the third element, implementation and operation, is started. In this element attention should be given to organizational structures, personnel, communication, documentation, operation control and emergency plans. In the implementation and operation element phase the commitment of the whole company is needed. Where necessary, the personnel should be trained to reach the required level of competence. Procedures must be communicated and documented. The operations should be controlled by identifying which activities are involved in the main environmental aspects and ensuring that they will be performed under controlled conditions. The control and corrective action phase consists of monitoring and measuring, corrective actions and auditing the environmental management system. In the last phase the management of the company should review the environmental management system.

EMAS

In the early 1990's the Eco-Management and Auditing System, EMAS, was founded. EMAS is a management tool to evaluate, report and improve the company's environmental performance. In the 1990's EMAS was focused on the industrial sector, but since 2001 EMAS has been open to all economic sectors. EMAS was extended with the integration of ISO 14001, which became the environmental management system required by EMAS. Adoption of EMAS in the company is voluntary for organizations operating in the European Union. To receive EMAS registration a company must conduct an environmental review, establish an effective environmental management system, perform an environmental audit and provide an environmental performance statement. When the environmental review, the environmental management system, the audit procedure and the environmental statement are accredited and registered by an official EMAS organization, the company can use the EMAS logo.

There are three main characteristics of the EMAS concept; performance, transparency and credibility. Performance is related to the fact that EMAS is a voluntary environmental management concept with the goal to improve the environmental performance of companies by committing themselves to monitor and improve their environmental impact. Transparency is achieved through the environmental statement that is required. The EMAS-logo that can be used is also a way in which the company can show their environmental efforts. Credibility is achieved by the accreditation and registration.

Comparison

The EMAS standard can be compared with the ISO 14001 standards, with some smaller differences (Gunster, 1995, Van Gerven et al 2005). EMAS is more explicit on compliance, requires more audits and is more specific in which environmental effects should be taken into account. The main difference is that in EMAS the company is obliged to publish an environmental statement. This should be made available to the public and regularly updated. This is more attractive from a stakeholder point of view, but it makes EMAS less flexible. In the Netherlands, the EMAS standard is less used than the ISO 14000 series. Main reason is that the EMAS is more focused on Europe, while the ISO 14000 series are internationally supported.

4.4.3 - Life cycle management

Life cycle assessment (LCA) is a complex tool that assesses the impact of a product over its total life cycle. LCA is an important tool for Life Cycle Management (LCM). According to the ISO 14040 principles there are four main components in LCA. The first component is the definition of goal and scope, in which also the functional unit of assessment should be determined. The second component is the inventory analysis, where data is collected, a process flow chart is made and the boundaries of the system are determined. The third component is the assessment of the impact. The impacts of all categories are classified, normalized and weighted. The last component of the life cycle assessment is the interpretation, in which the product is compared with other products and the bottlenecks are classified. These four components are presented in figure 4.2.

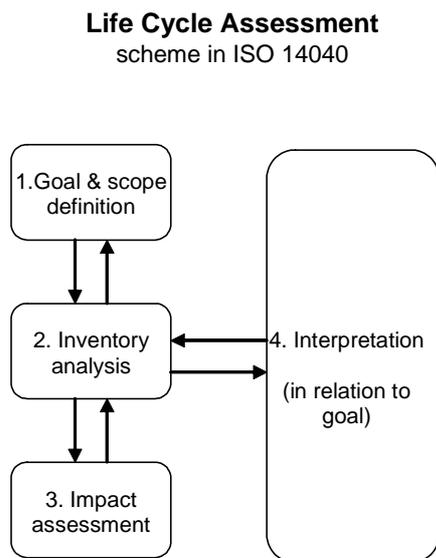


Figure 4.2 - Life Cycle Assessment scheme in ISO 14040

With the life cycle assessment there is a basis for life cycle management (LCM). LCM are the management activities directed to the *co-ordination and co-operation of actors in a product chain*, with the aim of reducing the *environmental impact over the whole of the product life cycle* (Van Koppen and Hagelaar, 2005).

For companies in the chain-oriented stage, as was mentioned in chapter 2.3, LCM is a way of safeguarding a green image, improving green marketing and maintaining a long-term competitive position in the market. The main aspects of LCM are analyzing the total environmental impact of the product life cycle and organizing the product chain to co-operate in making environmental improvements.

In relation to LCM there are 5 types of companies (Van Koppen and Hagelaar, 2005). These are companies that have:

- 1 No LCM (only internal environmental management)
- 2 Limited waste prevention activities, packaging reduction (no or limited use of LCA)
- 3 Defense of products (LCA used primarily to defend products)
- 4 Environmental product development and product (portfolio) decisions (using LCA)
- 5 Environmental integrated chain management (LCA, product design, environmental reductions over the whole chain, organizational adjustment)

Key-factors in organizing LCM are the identification of the main fields of application, such as waste prevention and product design, identify actors that are able to direct the chain such as chain directors, product associations, independent societies and governmental organizations, and extending existing structures of chain management to environmental issues.

To close the life cycle, all companies and stakeholders in the chain needs to cooperate. Supply chain management is the integrated planning, co-ordination and control of all logistical business processes and activities in the supply chain to deliver superior consumer value at less cost to the supply chain as a whole whilst satisfying requirements of other stakeholders in the chain. Porter (1985) mentions the value chain, where value is described as the amount that buyers are willing to pay for what a company delivers and is measured by total revenue. The value system comprises the value chains of suppliers, customers and the organization itself. To be a full member of a chain one needs to cooperate with other companies.

4.4.4 - Contribution of C2C to the environmental management

In § 2.3 C2C is compared with other environmental measures. Current environmental measures that are aiming at preventing environmental harm are often comparable with parts of C2C. The main difference is that C2C is something that manifests itself in all parts of the business-process, which leads to an environmental awareness that should be implemented not only on all managerial levels of the company, but in the whole chain. In the previous paragraph there was made a distinction between preventive and non-preventive environmental measures. It is obvious that C2C is a preventive way of dealing with environmental issues, because it avoids the generation of waste. In the same paragraph four levels of environmental care were mentioned. C2C has much in common with the chain-oriented stage. In C2C the company not only tries to make its products C2C, but also the production process, which is only possible when the whole chain cooperates. The materials of the product, the production, the transport and the collection of the used products to reuse them, every part of this has to meet the C2C standards to make the product completely C2C.

In the sub-paragraph about life cycle management eco-design was mentioned. According to Van Koppen and Hagelaar (2005) eco-design is focused at designing products with modified or new characteristics in order to minimize the environmental impact of the product over the whole product life cycle. Eco-design, sometimes also referred to as '*design for environment*', is to some extent comparable with C2C. In eco-design there are three goals:

- 1) reduce or minimize the use of non-renewable resources
- 2) manage renewable resources to insure sustainability
- 3) reduce toxic and other harmful emissions

There are many aspects which the company should pay attention to while trying to reach these goals. These goals should be reached at minimum costs, meet the customer's requirements and be manufacturable. The main difference with C2C is that there still is some waste, although there is a strong focus on recycling and reuse.

4.5 Conclusion

In this chapter theory on organizational characteristics was studied. The configurations of Mintzberg were discussed, in order to answer the first sub-question from the related research sub-questions from § 1.2.3; *How can organizations be characterized?*. In Mintzberg's organizational structures it is most likely that the organic structure or the machine-bureaucracy will adopt C2C. From these configurations, the machine bureaucracy will focus on cost-savings, while the organic structure will be more focused on differentiation. The organic structure will be the first to adopt C2C, because they are more flexible and innovative. In figure 4.3 this is represented. It is already mentioned that these two configurations are opposites, which is represented by the two arrows, pointing in opposite directions.

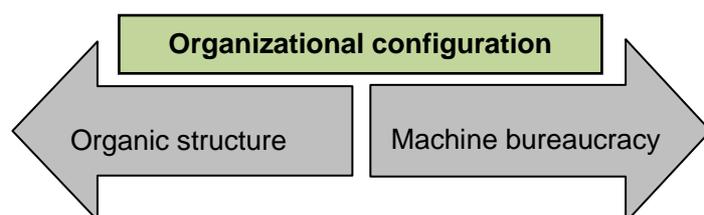


Figure 4.3 – Conclusion organizational configurations

When taking into account the different aspects of the two configurations, also on the process-level a distinction can be made between companies that would be more likely to adopt C2C in an early stage and the companies that follow in a later stage. The early adopters are more likely to have a focus on process change, while the followers will focus on process control. In figure 4.4 this is represented.

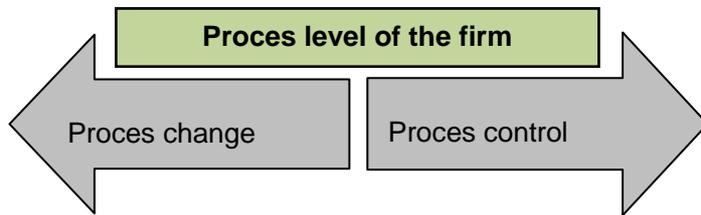


Figure 4.4 – Conclusion processes

C2C is a technological way of reducing the environmental burden of products, so it can be assumed that it fits strongly to companies with a strong focus on the technology, which implies an important role for the supporting staff and the technocratic staff. In the process of making products C2C, products often should be redesigned, or when this is not possible, totally new products should be designed. Therefore it might also be assumed that companies with a strong tendency on innovation will be more willing to adopt it. This gives a broad answer on the second research sub-question; *What characteristics are stimulating cradle-to-cradle?* In the interviews this will be analyzed further.

Environmental management on the organizational level is analyzed by theory on environmental indicators, internal and external measures and life cycle assessments. The position of the company with regard to the environmental awareness and the environmental performance can be measured with the help of environmental indicators. In the chain-oriented phase these indicators are focused on for example energy efficiency, usage of raw materials and water recycling, but also on the performance in the chain. With management performance indicators (MPI's) can be controlled to what extend environmental measures are implemented, what the financial performance is and which audits had positive results. In the chain-oriented and C2C methodology it is not always possible to measure direct savings, so it is important to report and communicate in a clear and transparent way.

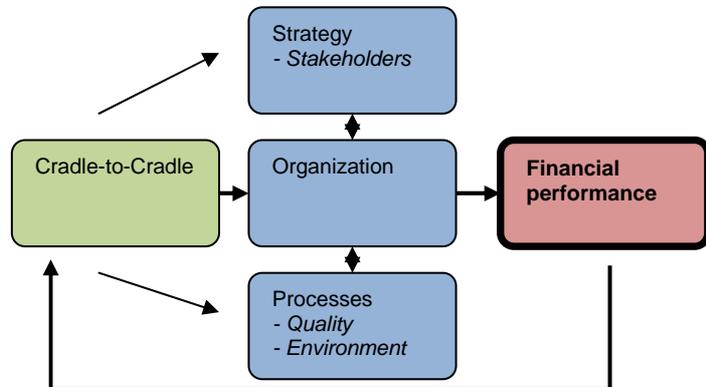
There are several phases in which the company can be positioned, regarding its attitude towards environmental measures. Environmental measures aiming at the avoidance of waste, which are referred to as preventive measures, are partly comparable with C2C. This holds even more for companies that implement these kinds of measures in the whole chain, the so-called chain-oriented phase. In the measures and management systems focused on the complete life cycle of the product this goes even further, because not only the other companies in the chain are involved, but also other stakeholders. C2C is focused on environmental change on a large scale. Products that are made according to the C2C principles should not only consist of C2C materials, but also be produced in a C2C way, and, preferably, also be transported, distributed and returned in their lifecycle according to the C2C principles. This answers the sub-question: *How does the cradle-to-cradle methodology contribute to environmental management?* In the interviews C2C and existing environmental management is compared.

The last research sub-question that needed to be answered in this chapter asked: *What organizational systems are used for quality control and environmental care?* Therefore, besides the structure of the organization, also the control mechanisms that are already present in the company are analyzed. Companies with highly integrated control systems may be more willing to adopt C2C. Therefore, on the process-level quality and environmental control systems were analyzed. Companies that implement quality certification processes get a lot of thought about their processes and how they can maximize quality and efficiency. There are several elements in these quality systems that also occur in C2C. The structure of environmental management systems is for an important part based on the structure of quality management systems.

Chapter 5 – Financial performance

5.1 Introduction

In this chapter the theories about financial performance are studied. The sub-questions formulated in chapter 1.2.3 will be the guideline in the structure of this chapter. The sub-questions asked what the basic theories are on the relation between financial performance and environmental performance, and how the financial performance is influenced by C2C. In § 5.2 a very broad overview is given of how the financial performance of a company can be influenced by stakeholders, strategy, organizational characteristics and C2C. In addition to this broad overview, a more specific example is given of the financial performance of a company that implemented C2C in § 5.3. In § 5.4 the influence of environmental management systems on the financial performance of the company is studied. This is done by analyzing theory about the linkage between environmental performance and financial performance. This chapter ends with a conclusion, in which the answers on the sub-questions will be extracted and summarized from the theory (§ 5.5).



5.2 Financial performance and the influence of C2C, strategy and the organization

There are many studies available on financial performance of firms, related to certain aspects that might influence it. It is quite obvious that for example stakeholders influence the financial performance, because stakeholders such as the customers buy the products, stakeholders such as the government can give subsidies, fines and quotas, and stakeholders such as suppliers can change the prices of the raw materials or half-products used in the production-process. It is however hard to say how the financial performance can be increased by changing the influence of the stakeholders. Good stakeholder-management may result in an increase in the purchase of the products by the stakeholders, or in making it more attractive to produce the products because of stimulating legislation and regulation, but it depends on the situation how this stakeholder-management should be developed. When looking at the influence of strategy on the financial performance of the company, this is even more difficult. In chapter four it is already stated that there is not one type of strategy that can be considered as the best one, or the most profitable one. This depends on the company and the market in which the company operates. A company with a reactive kind of strategy might for example financially perform very well, while a company with a prospector strategy might perform less. This is totally depended from the structure and the culture of the company, about which the same remarks can be made. The structure of the company is neither the crucial determent factor for the financial performance of the company.

Having integrated a certain strategy or organizational structure is not an obligatory condition for good financial performance. The decisions made within a certain organizational structure or type of strategy however, can lead to better financial performance. The adoption of an environmental management system may result in better financial performance, which will be discussed in more detail in the fourth paragraph of this chapter. Important is however that the environmental management system has a clear fit with structure and strategy of the company. The alignment of these systems and the company are very important.

The influence of C2C on the financial performance of the company is again dependent on the way in which it fits within the company. It is therefore important to analyze in which organizational structure and type of strategy C2C fits optimal. In the next paragraph some examples will be given of companies that made an increase in their financial performance while adopting C2C.

5.3 Example of the influence of C2C on financial performance

A good example of the influence of C2C on financial performance is the example about Ford Motor Company. McDonough and Braungart were asked to implement their C2C ideas on the Ford Motor Company's Rouge River plant in Dearborn, Michigan. This plant was built after the First World War and is one of the world's largest industrial sites and has a great impact on the local environment. At the end of last century the plant was getting outdated and did not meet the standards for production facilities. In May 1999 Ford decided to make this production complex an 'icon of the 21st century industry'. The complex was not only renovated, but transformed to a healthy, innovative place. McDonough and Braungart worked with Ford's executives, engineers and designers to explore ways to maximize profit by design decisions that also maximize social and ecological value. An illustration of the combination of increasing ecological and societal value and increasing profit is the system that Ford uses for storm water treatment. Usually storm water is regulated with expensive technical control systems. Ford estimated that new pipes and treatment plants for the Rouge River plant would cost up to \$48 million. McDonough and Braungart designed factory with 450,000 square-feet of roof covered with healthy topsoil and growing plants – a living roof. This 'living roof' slows and filters stormwater run-off, obviating the need for expensive technical controls, or even regulations. This redesign fits in C2C and besides this it resulted in a (first) cost saving of up to \$35 million (McDonough and Braungart, 2002-b).

Unfortunately C2C is at this moment only in use by very few companies. The few companies who work with C2C are often still in a phase where they think about making their products C2C. Some companies have products that are made C2C and are even certificated, but even these companies say they have no clear view on the financial consequences. Therefore in the interview section of this thesis will be searched for more examples.

5.4 Influence of EMS's on financial performance

In this paragraph the influence of environmental management systems on the financial performance of the company is analyzed. First a short overview of theories on this influence is given, followed by the different ways in which this relation exists. The third paragraph is an analysis of the direction of the causality.

5.4.1 - Prior research

A lot of research is already done on the influence of items as CSR or environmental management on the financial performance of the company. In prior research on the influence of environmental management on the financial performance of the company, there are three categories that can be distinguished. The first category is the researches that state that there is a negative relation between environmental management and financial performance. The second category consists of the research that sees no relation between environmental management and financial performance. The third category sees a positive relation (Waddock and Graves, 1997).

According to Waddock and Graves (1997), theory supporting the hypothesis that there is a negative relation between environmental performance and financial performance see the money invested in environmental management systems as a competitive disadvantage, because the costs of this system could have been avoided or could have been paid by others, like the government or consumer. When competitors don't invest in a certain environmental measure, authors in this category would advise not to invest either. In this category the general assumption is that environmental management will result in only a few benefits, but imply large investment costs.

Theory that state that there is a neutral association between environmental performance and financial performance often claims that there are too many intervening variables between environmental and financial performance, which make it impossible to expect a causal relationship. Another reason for a neutral relation is simply that the costs and benefits are more or less in balance. In table 5.1 a short summary is given of prior research and the main outcomes.

Table 5.1 - Overview prior research on linkage EM and financial performance

Study:	Major findings	Relation
Spicer (1978)	Low environmental performance results in higher risks and lower ROE (18 paper firms)	Positive relation
Alexander & Buchholz (1978)	Perception of social responsibility and risk-adjusted financial performance of 50 big firms	No relation
Shane & Spicer (1983)	Negative environmental information has a negative influence on returns	Positive relation
McGuire et al (1988)	Positive relation between reputation and ROA	Positive relation
Fombrun & Shanley (1990)	Positive relation between reputation and ROA, negative correlation between reputation and risk (292 firms)	Positive relation
Jaggi & Freedman (1992)	A weak negative relation on the short run (13 firms)	Negative relation
Hamilton (1995)	Event study: environmental activities compared with reaction stock market	Positive relation
Cohen et al (1995)	Firms that pollute less have significantly higher risk adjusted rates of returns	Positive relation
Klassen & McLaughlin (1996)	Event study: environmental activities compared with reaction stock market	Positive relation
Nehrt (1996)	Investments in cost-reducing pollution reducing technologies cause profit growth (50 chemical firms)	Positive relation
Feldman et al (1997)	Firms that improve their environmental performance realized lower capital costs	Positive relation
Cormier & Magnan (1997)	The greater the level of pollution produced by a firm, the lower its stock market valuation	Positive relation
Russo & Fouts (1997)	ROA compared with EM performance for 243 firms	Positive relation
Konar & Cohen (1997)	Environmental performance correlates with intangible asset value. Reducing emissions creates market value	Positive relation
Waddock & Graves (1997)	Financial performance depends a.o. on social performance	Positive relation
Judge & Douglas (1998)	Environmental issues in strategic planning are positive related to financial performance (196 firms)	Positive relation
Dowell et al (2000)	Firms which adopt global environmental standards that go beyond legal requirements have higher market values	Positive relation
Christmann (2000)	Innovation in pollution prevention delivers cost advantages (88 chemical firms)	Positive relation
King & Lennox (2001)	Tobin's Q regressed on environmental performance (652 manufacturing firms). Relation is often due to other circumstances.	Positive relation
Menguc & Ozanne (2005)	Environmental orientation is positively related to market share and profit, but negatively to sales growth (140 firms)	Both relations

Sources: Miles and Covin (2000), Murphy (2002), Haverkamp (2007), Ambec and Barla (2002)

Theory expecting a positive relation between environmental performance and financial performance expect that companies that lower their investments in environmental management will face a competitive disadvantage, which assumes that there is a positive relation between environmental performance and financial performance. Miles and Covin (2000) state that environmental performance will positively influence the financial performance because of the reputational advantages that will occur. They state that reputation has four main sources, which are credibility, trustworthiness, reliability and responsibility. This last source, responsibility, has three areas, which are financial, social and environmental. If the company acts in a responsible way according to the environment, this will lead to a better reputation, which will lead to goodwill and in the end to better financial performance. Klassen and McLaughlin (1996) also state that there is a positive relationship between environmental performance and financial performance. They state that although the costs for environmental improvement can be large, in the end it will "pay to be green".

As one can see in table 5.1, much research supports the positive relation between environmental performance and financial performance. In this thesis is therefore concluded that there is a

relation between environmental performance and financial performance, and that this relation is positive. However, it is also important to realize that this is not applicable in all cases. Some of the studies that found a negative or neutral relation made critical remarks about environmental performance being not always the only reason for the increased financial performance (King and Lennox, 2000). Much of the variance may also be the result of the fact that many firms that adopt environmental measures often already work in relative clean sectors or have certain attributes that make it more profitable or easier to benefit. As King and Lennox state: “firm attributes and different strategies for environmental improvement may moderate the apparent link”. They suggest that the well-known question “Does it pay to be green?”, should be replaced by the question “When does it pay to be green?” (King and Lennox, 2000). Environmental policy needs to be based in the structure of the industry in which the firm operates, the firm’s position within this structure and its organizational capabilities. “There is no one-size-fits-all environmental policy” (Reinhardt, 1999).

5.4.2 - Ways of influence

Assuming that there is a positive relationship between environmental and financial performance, it is important to know how this positive influence is achieved. The costs and benefits of an environmental measure can be divided in initial cost and benefits and operational costs and benefits, according to Van Koppen and Hagelaar (2005). Initial costs are the investments that are made, like the equipment and materials used, the establishment of the required facilities, the construction, training and costs of production-stops during the construction. Initial benefits can be subsidies from the government. Operational costs are salary for extra tasks and possible more expensive materials. Operational benefits are savings on inputs, reduction of waste processing costs, increased productivity and reduction of governmental taxes and levies.

According to Klassen and McLaughlin (1996) there are two ways in which the EMS can influence financial performance. The first one is the increase in market gains, the second way are the cost savings. In figure 5.1 this is represented.

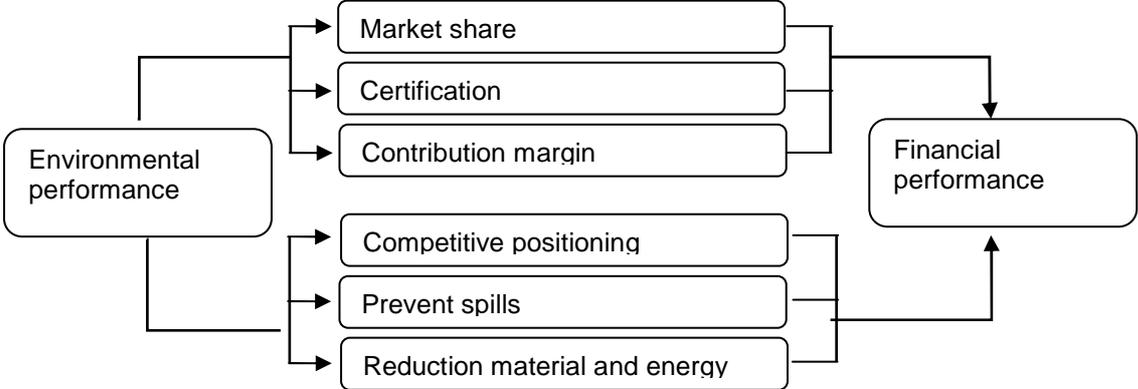


Figure 5.1 - Linkage of environmental performance on financial performance

Market gains are reached through certification, market share and higher contribution margins. When the company improves its environmental performance, this can be confirmed in a certificate, for the product or the production process. This will influence the perception of the consumer, which will lead to an increased market share and higher product contribution margins. This will result in an increase of the financial performance. Cost savings can be generated by competitive positioning for lower costs, prevention of spills and a reduction of the materials and energy used in the production process. The improved environmental performance will give the company a stronger position in the market, which can be maintained by pro-actively influencing the technical and environmental standards in the industry. The prevention of spills and environmental liabilities will help to avoid costs and fines from government. The risks will be limited, which give the company a stronger position in relation with their investors and the government. The reduction of raw material inputs and energy consumption will lead to a greater productivity. All these cost savings will lead to improvements financial performance.

5.4.3 - Direction of causality

When analyzing the influence of environmental management on the financial performance of the company, one could also turn this around and ask what the influence of financial performance is on the environmental management of the company. For both views there are some obvious arguments. An increase of the environmental performance can result in an increase of the financial performance of the company, as is described in the model of Klassen and McLaughlin (1996). The other way around, there can also be argued that the company will invest in environmental performance when this fits in the financial performance of the company. Waddock and Graves (1997) named this the 'slack resources view', a company that financially performs well, will invest the slack resources in other domains, like social or environmental domains. Better financial performance would be a predictor of better social or environmental performance. In other words, the direction of the causality asks whether financial performance comes before or after environmental performance.

A method used in the analysis of this causality is the so-called event-methodology. In event-methodology the financial performance of the company is analyzed in the time-period around events that are of great influence on the image of the company. An example of such an event can be when the company is mentioned in the news because of achieving some environmental standard, or because of the spill of toxic waste. The consequences on the financial performance are found by analyzing the stock value of the company, assuming that the stock market reacts strong and in time on the news about the company. News about the environmental performance of the company can be released in the media because of the transparency that is required by governmental law about the emission of hazardous substances. Market-analysts can conclude what the environmental performance of the company is, and what patterns can be found in the environmental performance of the company. Companies that are often mentioned in the media in relation to bad environmental performance will be regarded as companies that have to make costs on the clean-up and avoidance of environmental harm, which can have a negative influence on the stock value. Hamilton showed that the stock value of the company decrease when negative environmental performance is reported in the media (Hamilton, 1993). Also Klassen and McLaughlin (1996) used the event-methodology in their research. The increase in financial performance because of market gains and cost savings, as was described in the previous subparagraph, supports the idea that environmental performance influences the financial performance, in which case the increase of financial performance comes after the increase of environmental performance. The event-studies of Klassen and McLaughlin (1996) showed that the impact of bad environmental performance had a negative influence on the stock-value of the company, and also the other way around, good environmental performance lead to an increase in the stock value of the company.

The research of Hamilton (1993) and of Klassen and McLaughlin (1996) seem to support the causality of environmental performance as determinant for financial performance. Waddock and Graves (1997) however state that both cases are possible and can occur together at the same time. In the case of the slack resources view, increased financial performance determines increased environmental performance. On the other hand can be stated that because of good environmental management and strong stakeholder-management the increase of environmental performance will result in increase in financial performance. Waddock and Graves (1997) state that environmental performance is positively related to financial performance, and that both influence the other, so there is a two-way causality. Off course, this does not hold endlessly, as Nohria and Gulati (1996) showed in their inverted-U analysis. They state that there is a clear relation between slack and investments in innovations, but that the relation was not always positive. Nohria and Gulati showed that the positive or negative impact of slack on innovations is a function of how much slack existed within the organization. A moderate level of slack has a positively influence on the investments in innovation, but at a certain point there can be too much slack, which results in a negatively impact on the innovation within the organization. This is explained by the fact that the availability of slack resources offers the availability to experiment with innovations. On the other hand this may result in a lack of control on the extra expenditures, and innovations might be realized, without added value for the company (Geiger and Cashen, 2002).

5.5 Conclusion

In this chapter theory on the linkage of financial performance on environmental management is studied. The research sub-questions that were answered were “*what are the theories about financial performance in relation to environmental care?*”, and “*how is financial performance influenced by the cradle-to-cradle methodology?*”.

Prior research showed that there is a significant relation between environmental performance and financial performance. There are two ways in which this influence appears; by cost-savings and by an increase in revenues. Cost-savings are achieved by a more efficient production-process and savings on waste-treatment and levies. Increased revenues can be achieved by creating a ‘green’ image.

The relation between environmental performance and financial performance also works the other way around. The financial performance also influences the environmental performance, which is depending on the amount of money invested in environmental care systems. So, both environmental performance and financial performance are influencing each other.

When comparing the strategic typologies from chapter 3 with the two possible ways of influence on the financial performance, prospectors will be merely focused on the revenue-side, because they know how to sell the ‘green’ image of the firm, while defenders will be more focused on the cost-savings, because they are focused more on efficiency-skills.

In this chapter an example is given of the influence of C2C on the financial performance of Ford. This is one of the companies that already have a good view on the financial consequences of the C2C measures they implemented. However, many companies are not yet that far in implementing cradle-to-cradle, that they can give a clear view of the financial consequences of it. Therefore, in the interviews will be continued on this, also by comparing C2C with existing environmental measure systems. In chapter 2 it was already mentioned that C2C can be compared with preventive environmental management systems. C2C leads to cost-savings because it results in lower expenses on waste-treatment, raw materials, levies and energy. On the revenue-side C2C might help the company to get a better image by C2C certification, and by the increasing attention in the media and by consumers for C2C products.

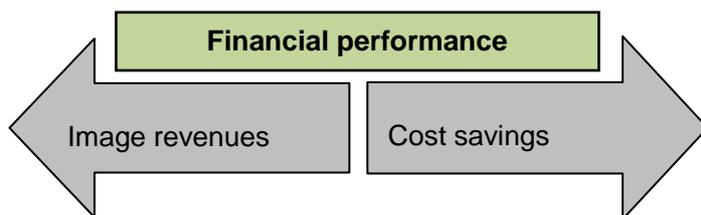


Figure 5.2 – Conclusion financial performance

So, it might be expected that the positive relation between environmental management and financial performance also works for C2C, although there is not many information about it yet. Therefore, in the interviews this will be investigated further. For now, the main areas of financial performance as result of C2C are given in figure 5.2. On the one side increased financial performance might occur because of an increased image, on the other side also the cost savings are important.

Chapter 6 – Interview protocol

6.1 Introduction

Chapter six is the bridge between two important parts of this thesis. In the first part, chapter two till five, the literature study was conducted, in the second part the results of the interviews will be analyzed¹. In this chapter, there will be started with looking back to the research model as described in the first chapter of this thesis, and the related research (sub-)question(s). There will be analyzed to what extent the research (sub-) questions are already answered in the literature study. The questions that are already answered in the literature study will not be dealt with in great detail, this will be done in the conclusions in chapter 8, so the main answers are mentioned shortly, or the paragraph in the literature study where it can be found is mentioned. In § 6.3 the interview-strategy will be discussed, focusing on the set-up of the interviews, the selection of the respondents and the relation of the interview questions with the research questions. In the final paragraph is discussed how the analysis will be done.

6.2 Retro-perspective view on the research (sub)questions

In this paragraph will be focused on the research sub-questions that were formulated in chapter 1. First the research model to which the sub-questions are related is given once more, followed by an overview of the research sub-questions and how and where they are answered. The outcomes are used to decide what topics should be included in the interviews.

6.2.1 - The research model

The research model is described in chapter one. The research sub-questions are related to each of the five elements in this model. The research model that is used in chapter one is given again, in figure 6.1.

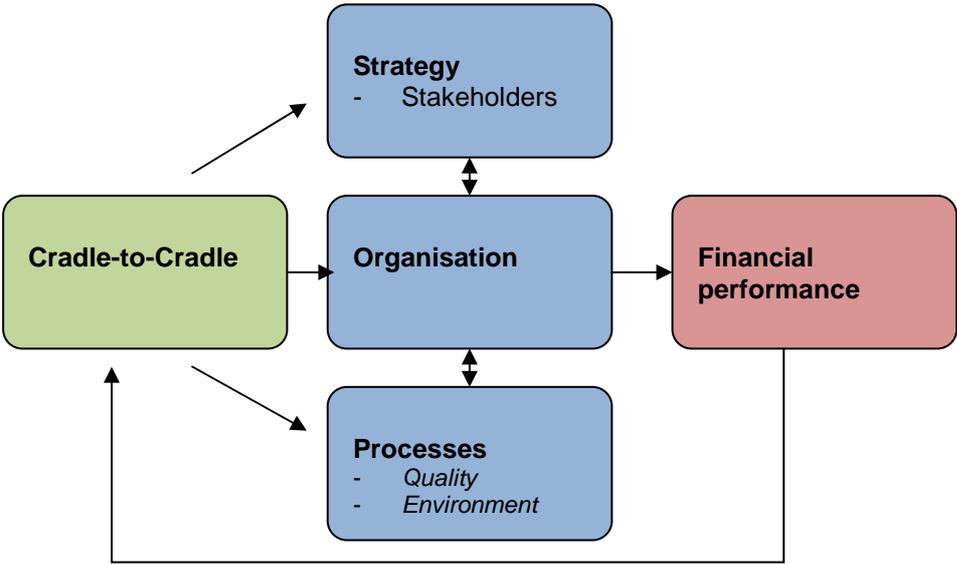


Figure 6.1 – Research model

C2C influences the three managerial levels. These three elements of the company are interconnected and accomplish the financial performance. The financial performance is influencing the adoption of C2C, which closes the cycle. The middle column of the research model represents the company and its environment. The literature study showed that the organization can be split in three organizational levels; strategic, tactical and operational, which represents the strategy, the organization and the processes. The strategic level involves the decision-making in the company, influences from outside the company and the long-term strategy.

¹ See also the research framework in paragraph 1.1.4

The tactical level involves decisions from experience, like the purchase of materials and setting the prices, and the internal communication of the vision of the company. Operational decisions are practical decisions like the design of processes and concrete actions, often related to logistic matters. In some environmental management systems, like ISO 14000, these three levels of direction appear as a kind of cycles (Van Koppen and Hagelaar, 2005). In the strategic cycle the environmental statement and the audits are embedded, environmental policies are part of the tactical cycle and in the operational cycle the daily practice and control. The environmental management systems that were analyzed in chapter five are an example of processes, while the environmental management is part of the organization.

6.2.2 - Answering of the research (sub-)questions

The research questions are connected to the five areas from the research model. For each question is mentioned if it is already answered in the literature study, or if additional research in the interviews is needed. As mentioned in the introduction of this chapter, this paragraph is not meant to give a final conclusion of the literature study, which will be done in chapter 8.

The research sub-questions are of course all related to the main research question, which is stated below:

Research question:

To what extent does the cradle-to-cradle methodology contribute to the for-profit goals of companies?

The sub-questions that are related to this are given below, in the same order as in chapter one, followed by an indication if they are answered in the literature study.

Sub-questions:

1- Cradle-to-cradle

- a) What is C2C?
→ In the literature study in chapter two C2C is explained as a concept aiming at the complete recycling of materials, without loss of quality. In § 2.2 the main ideas of the concept are described.
- b) How is C2C related to environmental management systems?
→ In the literature study in chapter two, C2C is compared with existing environmental management systems. C2C can be compared with environmental management systems that focus on the prevention of waste. More information can be found in § 2.3.
- c) What are motives for C2C?
→ In chapter two, in § 2.4, some motives for C2C are given. These are divided in environmental and financial motives. However, the argumentation for the financial motive is not very explicitly for C2C, but more focused on existing environmental management systems. Therefore, this will be part of the interviews.

2- Strategy and stakeholders

- a) How does C2C fit in existing theories about strategy?
→ In § 3.3 the five forces of Porter, the Resource Based View and the four categories of companies that Miles and Snow defined are described. From these categories, the defenders are the most likely to adopt C2C for reasons of cost-savings. The prospectors are the most likely to adopt C2C because of increasing revenues and image. More information can be found in chapter 3.3.5.
- b) How does strategy align stakeholders and organization?
→ Alignment can be studied from many different perspectives, as was showed by the model of Venkatraman and Camillus. Important for managerial decisions is to know what the domain of the alignment is. This can be internal, external or integrated, whereas the integrated domain seems to have the most similarities with C2C. More backgrounds on alignment can be found in § 3.4. Because C2C needs to be supported by the whole company, in the interviews the fit between different managerial levels is taken into account.

- c) What is the role of stakeholders in the environmental awareness of companies?
→ Literature showed that stakeholders influence the environmental awareness of the company. Especially the role of the consumer is important (Polonsky and Ottman), although the most direct influence is perceived to come from governments (Madsen and Ulhoi). More information can be found in § 3.4.
- d) What contribution does C2C make towards stakeholder goals?
→ In the literature study in chapter three, the fractal triangle is mentioned (figure 3.3). This triangle represents the economical, ecological and social aspect of C2C. C2C aims to focus on all three of these aspects, and therefore will contribute to the stakeholder goals.

3- Organizational characteristics

- a) How can organizations be characterized?
→ Literature showed in chapter five that there are three organizational levels. Strategy, which is already described in chapter three, the organization and the processes. In § 5.2 the characterization of Mintzberg is analyzed. From these characterizations, the organic structure and the machine-bureaucracy are expected to fit most in the C2C characteristics. This is included in the interviews.
- b) What characteristics are stimulating C2C?
→ Especially the technological staff and the supporting staff need to be well-developed in a C2C company, because of the, often complex, redesign of the product and the production process.

4 - Processes

- a) What organizational systems are used for quality control and environmental care?
→ In § 5.4, examples are given of these systems, as a part of the organizational processes. The INK/EFQM-model pays a lot of attention to the importance of processes in the company. The ISO 14000-series give a good view on environmental management systems.
- b) How does C2C contribute to environmental management?
→ This is partly described in chapter two, where C2C is compared with preventing environmental management systems. In chapter five is explained that C2C can contribute on a bigger scale, because it focuses on the whole company, or even the supply chain. This will bring the environmental management to a higher level, as is described in § 5.6.

5- Financial performance

- a) What are the theories on the linkage of financial and environmental performance?
→ In chapter five the ways in which environmental management influence the financial performance is analyzed. There is a positive relation between environmental performance and financial performance, in both directions.
- b) How is financial performance influenced by C2C?
→ There is not very much data on the financial consequences of C2C. However, prior research shows that there is a positive relation between environmental performance and financial performance of the company, and C2C can be compared with certain aspects of existing environmental care systems. To get more information about this, interviews will be carried out.

6.2.3 - Further investigation

The previous sub-paragraph showed that most of the sub-questions can be answered with the information found in the literature study. This meets the expectations from the research proposal, where was stated that this research would mainly be a desk-study. However, some of the questions need to be answered with help of the interviews. These questions are the question about the motives for adopting C2C (question 1c), the fit between the three managerial levels (question 2b), the organizational structures that are most suitable for C2C (question 3) and the question how C2C influences the financial performance of the company (question 5b). Therefore, in the interviews will be given further attention for these topics.

Besides the research sub-questions that need more investigation, there also needs to be given more attention to the main conclusions of the previous chapters. In the previous chapters the main conclusions upon the three managerial levels and the financial performance were presented in figure 3.4, 4.3, 4.4 and 5.2. When comparing these conclusions, it shows that there are each time two opposite possibilities that might contribute to the adoption of C2C. When analyzing the comparisons between these figures, these areas are divided in companies of type I and type II. In figure 6.2 this is represented:

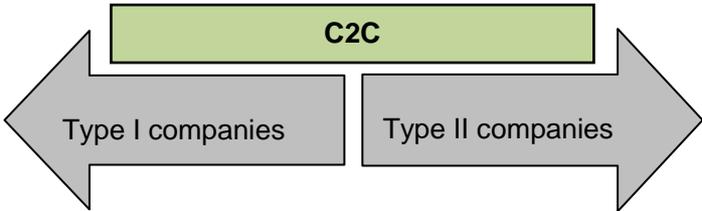


Figure 6.2 – Directions of the different main conclusions

In the interviews it is important to get more information about this distinction. Is there really a distinction in these two opposite stages of adoption, or are the several different conclusions suitable besides each other? To get a clear view on the main conclusions and how they can be divided in type I and type II, they are given once more in table 6.1. The main conclusions are combined for both types.

Table 6.1 – Matrix different main conclusions literature study

	Type I companies	Type II companies
Strategy	Prospector	Defender
Organization	Decentralized Mutual adjustment Organic structure	Centralized Top-down Machine bureaucracy
Processes	Flexible Innovative Process change	Non-flexible Procedures stable Process control
Financial aim	Image revenues	Cost savings

6.3 Interviews

In this paragraph will be focused on the kind of research, how the interviews will be set up and how the respondents were selected.

6.3.1 – Explorative research

As was mentioned in § 1.2.2, the interviews are conducted in addition to the literature study. The main focus is on the literature, the interviews serve as additional information to get more examples of how C2C is used in practice, and to get an impression of the characteristics of C2C and how they might relate. Therefore, the interviews are explorative, which, according to Baarda and De Goede (1995) means that the research is done without clear theories or hypotheses that can be used. Explorative research is characterized by the fact that there is no clear theory about the topic available. Comparing it with other research strategies, it is positioned between describing and explaining research. Describing research describes a situation, explaining research gives evidence for certain theories or hypotheses, explorative research has an in-between position. In large research-projects, it is often used in combination with explaining research, but according to Baarda and De Goede (1995) it can also be used separately, which in this thesis is done.

The consequence of explorative research is that the outcomes are not always completely reliable or used to give general applicable answers. Explorative research is used to describe

characteristics and to find relations between them. In this thesis the interviews are used to analyze which characteristics of C2C, as they were found in the literature study, are also found in the companies that already work with C2C, and to see if there is a relation between the different characteristics.

6.3.2 - Set-up of the interviews

The interviews are set up as follows:

- Common questions about the company and respondent
- Questions about the five core-elements of C2C, per organizational level
- Questions about the organizational characteristics
- Questions about financial performance
- Questions about C2C

First some common questions are asked about the company, such as its name and sector. These questions are needed to get a clear view of the different respondents. Then the real interview begins with some questions about the environmental management of the company. This is done in such a way that all elements of C2C are included, without mentioning them explicitly. In these questions also is analyzed how the company's environmental management is supported by each of the three different organizational levels. More information on this can be found in § 6.4. These questions are followed by some questions about the way in which the company is structured and how the financial performance of the company is related to their environmental efforts. Then a short explanation of C2C is given, followed by a list of questions about C2C. The participating companies are asked to give some open answers on specific questions about C2C, followed by some more general questions about C2C.

C2C is specifically mentioned in the final part of the interview. The reason for mentioning C2C in the end of the interview is to make sure that respondents without a clear image of C2C answer the questions about the five elements of C2C in an objective way, and to ensure that all respondents have a similar image of what is meant with C2C in the last questions.

6.3.3 - Respondents

The respondents are found in companies that already work with C2C and in companies that already do a lot with environmental management. This last group might have a lot of aspects in their environmental management that touches the C2C ideas, although these companies possibly do not mention it as C2C. These companies were selected via C2C experts and companies that were known to be leading in C2C in the Netherlands, which were selected via Senternovem, the Dutch chamber of commerce (KvK), Wageningen UR, Hogeschool Zeeland, NUTEC and the Dutch C2C network. Companies that worked together with EPEA are selected as the companies that officially work with C2C. Besides these companies, other companies were selected that did not yet work with C2C, but that are interested in the concept, or have similarities with the concept. These companies are again selected via the same organizations. The reason for this is that there aren't many companies in the Netherlands that actually work with C2C¹, so also the companies that are interested but do not yet work with it are important to get an impression of the actual opinions about it. Besides, this last group also might be more critical about the concept, which helps to give a more balanced view.

The question rises if there might be a bias, because of the fact that only companies that work with C2C, or at least are interested in C2C, are selected. To some extent, this bias will exist. On the other hand does this thesis focus on the C2C concept, so it is necessary to interview companies working with C2C. To avoid that companies would react very enthusiastic on questions, only because they were referring to C2C, first the C2C concept is not mentioned in the interview questions. The respondents were asked to react on statements about environmental measures, of which each had something to do with the C2C concept, but not explicitly. Therefore, I assume that the respondents did not react biased.

¹ For example; on the first cradle-to-cradle fair, the NUTEC fair in November 2008 in Frankfurt, were about forty companies represented, of which only a third really had cradle-to-cradle products. The other companies only had some aspects of their environmental strategy that matches with some of the cradle-to-cradle ideas.

6.4 Analysis

The interviews are used to answer four of the research sub-questions. The interview consists of 15 questions. These questions in almost all cases consist out of a number of statements where the respondent can agree or disagree upon, using a 7-point scale.

In table 6.2 is listed which question is used for which sub-question. In this table is also mentioned which questions are about C2C, despite the fact that C2C is not mentioned explicitly in each question.

Table 6.2 – Matrix interview questions and research questions

Question	1&5: Financial motives	2: Fit	3: Configuration	C2C
1		X		X
2		X		X
3		X		X
4		X	X	X
5	X		X	
6	X			
7	X			
8				X
9				X
10	X			X
11	X			X
12		X	X	X
13	X			X
14	X			X
15	X			X

The first sub-question that is included in the interviews is related to the financial motives of the firm for implementing C2C. This has a lot to do with the last research sub-questions, about the relation between financial performance and C2C. These two questions on the financial motives and consequences for the adoption of C2C are answered in the financial section of the interview, questions 1 till 4, and in the financial section of the C2C questions. Research sub-question 2 about the fit between the different managerial levels is answered in the section about the five aspects of C2C. The questions in this section are related to the strategic, organizational and process level of the company. The last sub-question that is included in the interviews is question 3 about the organizational structures 'organic structure' or 'machine-bureaucracy', which is answered with the questions in the part about the organization, and by the question about organizational structures and C2C, question number 12.

The link between the interview questions and the questions related to financial performance is quite clear. The question on fit is a little more complex and will therefore be explained. Before explaining the structure of these three levels, also the reason why the five elements of C2C are included needs to be explained.

In the interviews C2C is not mentioned from the beginning onwards, because some of the companies that are interviewed do not work with C2C, or work only with parts of the methodology. To measure to what extent they work according to the C2C principles, the most important elements of C2C are used separately in the interviews. These five characteristics, which also can be found in the C2C certification criteria (McDonough and Braungart, 2007), are as follows:

- Materials: the product is designed in such a way that none of the materials used to produce it contains hazardous or toxic elements.
- Recycling: the usage of recycled materials which can be recycled again
- Water: saving water during the production process and taking care that the water that leaves the company is clearer than how it entered
- Energy: effective use of energy, while using sustainable energy sources
- CSR: the company has a strategy for corporate social responsibility and ethical standards and has embedded this in the organization.

When these five characteristics of C2C are put in a matrix together with the three managerial levels, this leads to the following combinations.

Table 6.3 – Matrix managerial levels and cradle-to-cradle characteristics

	Strategy	Organization	Processes
Materials	MS	MO	MP
Recycling	RS	RO	RP
Energy	ES	EO	EP
Water	WS	WO	WP
CSR	CS	CO	CP

The codes in table 6.2 are formed by the First letter of the C2C characteristic that it refers to, followed by the First letter of the managerial level. The codes in the matrix relate to the questions in the interviews. These questions are given in table 6.4. In the interviews they are formulated as statements on which the respondent can agree or disagree, using a 7-point scale, where “1” stands for strong disagreement, and “7” for strong agreement.

Table 6.4 – Linkage of interview questions to matrix 6.3

Code	Question
MS	There is a strategy to deal in a responsible way with the hazardous materials that are still in use
MO	We minimize the usage of hazardous materials
	We are looking for alternatives for hazardous materials
MP	Our products are (re)designed in such a way that it contains no hazardous materials.
	Only sustainable materials are used
RS	We stimulate returning products to recycle them
RO	We have a recycling department in our company
RO / RP	Our products can be recycled / decomposed
	Our products are easily disassembled
	Our products are designed in such a way that they are easy to recycle
	We have the logistic processes to gather our products at the end of their lifecycle so we can recycle them.
ES	Strategy is developed for efficient energy use
EO	Solar energy is used for the production process
EO	Solar energy is used in the whole company
EP	The energy use for recycling is taken into account in the product-design
WS	Strategy is developed for efficient water use
WO	Water that leaves the company is cleaner than when it entered
WP	In the production process we try to save water
CS	There is a CSR strategy
CO / CP	This CSR strategy is known by our employees

These questions will be used to analyze to what extent the company already works according to the C2C principles, but also to analyze the fit between the three managerial levels. In table 6.5 is showed which questions are used to measure this.

Table 6.5 – Linkage of interview questions to managerial levels

Managerial level	Question
Strategy	1e, 2f, 3a, 3e, 4a
Organization	1a, 1b, 2e, 3b, 3c, 3f, 4b
Processes	1c, 1d, 2a-d, 3d, 3g, 4b

The questions about the organic structure and machine-bureaucracy are formulated according to the key-characteristics of these configurations, as mentioned in chapter 4. The organic structure is characterized by a strong supporting staff (to which is related in the questions about R&D) and a dynamic environment (which is related to by questions about innovativeness, the market and decentralization). The machine-bureaucracy is characterized by a strong technocratic staff (which

is referred to in the questions about planning and control and R&D) and decentralization (which is related to by questions about innovativeness, the market and decentralization). In table 6.6 the related questions are mentioned.

Table 6.6 – Linkage of interview questions to Mintzberg's configurations

Configuration	Question
Organic structure	4d, 4e, 4f, 4g, 5e
Machine bureaucracy	4c, 4e, 4f, 4g, 4h, 5e

6.5 Concluding remark

Not all companies that were approached wished to cooperate. Unfortunately, also some of the leading companies in C2C decided not to take part in the interviews. In total 15 companies participated in the interviews, while 34 companies were (repeatedly) approached.

The interviews were carried out in Dutch, a translated version of the interview protocol can be found in the appendix. This interview protocol was checked by the scientific advisor from the Wageningen University.

Chapter 7 Interview results

7.1 Introduction

In this chapter the outcomes of the interviews will be analyzed. In § 7.2 the general characteristics of the companies that were involved are mentioned. In § 7.3 the results related to C2C are studied. In § 7.4, 7.5 and 7.6 these results are linked to the research questions that would be analyzed, which are about the managerial levels, organizational structures and financial performance. In § 7.7 some final remarks will be made.

7.2 General facts

In this paragraph the general characteristics of the participating companies will be dealt with. First several remarks about the respondents will be made, followed by the different sectors the participating companies come from, the size of these companies, both measured in turnover and number of employees, and the degree to which these companies are 'officially' involved with C2C. This is done to get a clear view on the participating companies, which is helpful in the further analysis.

It is important to realize that the interviews are used in addition to the literature study, as an exploring research. This means that it was not meant to be a representative research which could be used to find evidence for theories or hypotheses, but as a way to find some more information about the use of C2C. In chapter 6 this is explained more extensively.

Some of the participating companies did not want to be mentioned in the report. To secure confidence, the names of the companies are not mentioned, but the companies are given numbers. The examples that are given are from companies that did not ask for confidence and/or from sources that are widely available, such as the websites from these companies.

In table 7.1 the characteristics of the participating companies are given. In the first column the identification numbers of the companies are mentioned, which helps to identify which answers belong to which company. The numbers do not relate to any kind of range, but are sorted on the last column, which indicates if the products from these companies could be returned in the biological or the technological cycle.

In the second column the sector in which the company operates is mentioned, followed by the number of employees and the annual turnover in million euro's. In the fifth column the function of the respondent is mentioned, followed by the years of experience. The names of the company and the respondents are not mentioned to ensure confidence.

In the 7th column the most obvious activities of the company, related to C2C, are mentioned. This can be one of the five elements that also are mentioned in the interviews, materials, recycling, energy, water and CSR, but also collaboration with EPEA, life cycle management or design for the environment. In the 8th column is marked if the company 'officially' collaborates with EPEA, the official C2C certifying institute, which is already mentioned in chapter 2. The last column is related to the cycle in which the products of the participating companies can return, which are the biological or the technological cycles. Also these cycles are described in chapter 2.

Table 7.1 - Overview characteristics participating companies

Firm	Sector	Number employees	Turnover (mln. €)	Function respondent	Experience (years)	Main C2C related activities	C2C ¹	Cycle ²
1	Personal care products	100	n/a	Environmental manager	2	Material, certificating	X	B
2	Personal care products	186	60	Manager operations	10	Recycling, C2C supply chain	X	B
3	Agro and energy	3	n/a	Owner and director	4	Water, energy, recycling	X	B
4	Horticulture	80	n/a	Management assistant	4	Pilot, energy, materials		B
5	Packaging & disposables	80	36	Commercial manager	20	EPEA, material	X	B
6	Waste management	180	19	MT / business development	10	Recycling		B
7	Industry	8	n/a	CEO	30	Materials	X	B
8	Solar Roofing	10	n/a	CEO	6	Recycling	X	T
9	Ceramics	600	115	KAM Manager	13	EPEA	X	T
10	Technics	25000	300	Head Research	9	Eco-design		T
11	Painting and maintenance	60	6	CEO	4	Waste, energy, product design		T
12	Office furniture	13500	270	Marketing & Communications	1	C2C products & supply chain	X	T
13	Metalektro	1450	270	Coordinator CSR and sustainability	2	LCM, materials, EPEA	X	T
14	Glass and metal	24	45	Plant manager	8	Recycling waste materials		T
15	Infrastructure and consultancy	4500	327	CEO	26	Research in collaboration with EPEA		T

¹: a "X" indicates that the company is officially working with C2C, in cooperation with EPEA (see §7.2.4)

²: a "B" represents a biological cycle, a "T" represents a technological cycle (see §2.2.4 and 7.2.2)

7.2.1 - Respondents

The respondents from the bigger companies were often environmental managers. Besides their environmental responsibilities they often also were responsible for quality, labor and CSR-related decisions. The respondents from the smaller companies often were the owners of the company or members from the management team. The years of experience in these functions range from one till 30 years. Because of the different kinds of functions of the respondents and the size and sectors of the companies they represented, there cannot be said much more about them.

7.2.2 – Sectors

As is mentioned before, the participating companies are from diverse backgrounds. Also the sectors in which they operate are very diverse. Before going into more detail, a first rough distinction is made between companies with products that can be classified as products in a biological cycle and products from a technological cycle. These two cycles are of great importance in C2C, like is described in §2.2.4. The companies with products that can return in the biological cycle are merely found in the fast moving consumer goods (FMCG), like the two companies that produce hygienic and personal care products (firm 1 and 2), the agro-food producing company (firm 3), the packaging company (firm 5) and the company that works in the horticulture (firm 4). These companies produce products that have a relative short life-cycle. The companies focused on personal care products for example produce soap and cleaning products (firm 1) and tissues and disposable towels (firm 2). Firm 3 and 4 both focus at food, which is the clearest example of product that returns in the biological cycle. They produce fish and vegetables respectively, while firm 3 also produces its own energy. Firm 5 has many food-related packaging products, including disposable cups and plates. All these firms produce products that are biological compostable. For the food products this is inherent to the product, but also the soap can be decomposed, just as the packaging from firm 5, which is made from bio-plastics and other

biodegradable materials. Firm 6 is a waste management firm, but the products that were investigated in the interviews are made from biological waste and are recycled at the end of their life-cycle in a biological way also. The respondent from firm 7 described its sector as 'technics', but uses a potato-based bio-plastic to produce its products, which results in products that can biological decomposed at the end of their life-cycles.

Firm 8 produces solar-roofs. The materials of which these roofs are made can be classified as part of the technological cycle. This is also the case for the tiles from firm 9, the printing machines from firm 10, the paint from firm 11, the furniture from firm 12 and 13 and the glass constructions from firm 14. Firm 15 works besides its activities in the infrastructure also as a consultancy office, but the activities in infrastructure are from a technological nature. The consultancy activities of this firm are not taken into further investigation in this thesis.

The sectors are very diverse, but the differences between the participating companies might also be due to their sector. Therefore, a very rough distinction is made, between companies from the (manufacturing) industry, companies in the fast-moving consumer goods (FMCG) and companies that operate in the chemical industries. Firm 1 till 4 are operating in the FMCG-sector, firm 5 till 8, 10, 12, 13 and 25 are from the industrial sector and firm 9, 11 and 14 are from the chemical sector.

7.2.3 - Size

The size of the participating companies is almost as diverse as the amount of sectors they come from. The size of the companies is measured using the amount of employees and the turnover. Before giving a description of the size of the companies, two remarks need to be made. First, there are several companies that are part of a bigger parent company. Therefore, the figures for the employees and turnover are bigger than for the location in the Netherlands. However, the products are often the same as their parent company sells, and it was not always clear what part of the company should be included in the figures and what part not (for example if the company had several locations in the Netherlands, so the amount of employees and the turnover hat are given in table 8.1 are from the complete company. The second remark is related to the fact that some of the companies did not want to publish their financial results. Five of the participating companies did not want to give information about their turnover. This has to do with company policies or because of the fact that the respondent did not know by heart what the figures were. Because in this thesis these figures are only used to get an impression of the participating companies, this does not matter very much.

From the ten companies that gave their turnover figures, the smallest is firm 11, with six million euro turnover. The biggest is firm 15, with 327 million euro. As was mentioned above, the parent companies are the biggest explanation for the big differences in turnover.

The amount of employees also differs a lot, from three employees at firm 3 till 25,000 employees at firm 10. When categorizing the firms according to the EU-standards (see also chapter 2), companies with less than 50 employees are seen as small firms, companies with 50 till 250 employees as middle-sized firms and companies with more than 250 employees as big firms. According to this definition, in this thesis four small, six middle-sized and five big companies were involved.

7.2.4 - Cooperation with EPEA

In §2.2.5 is described that EPEA is the organization that is involved in the C2C certificating of products and materials in Europe. Companies that cooperate with EPEA do not necessarily have to have a C2C product, but show their interest and good intentions to work with C2C and the will to use the expertise of EPEA. From the 15 participating companies, 9 said to have contacts with EPEA. Some of these companies are still in an orienting phase, where they try to find possibilities to make parts of their company or of a specific product C2C, other companies use the cooperation with EPEA in a further stage, where they specifically search for C2C materials for their products. One of the companies cooperates with EPEA to promote C2C in their environment. Because the cooperation with EPEA costs the company money, and because the company cannot get a C2C certificate very easily, the cooperation with EPEA can be used as a classification for the companies to see how 'officially' they are involved with C2C. However, one

should keep in mind that also companies that do not cooperate with EPEA can be very serious about their C2C efforts, but just don't see the benefits of making it 'official'. In box 7.1 more information is given about the activities of EPEA and how the interviewed companies are involved.

Box 7.1 EPEA

EPEA, the Environmental Protection and Encouragement Agency, was founded by one of the authors of the cradle-to-cradle book, Michael Braungart. EPEA works with clients worldwide to apply the Cradle to Cradle methodology to the design of new processes, products and services. EPEA states its mission as:

It is EPEA's ambition to mainstream the Cradle to Cradle methodology and practice. In such context, "environmental protection" will have lost its meaning, as we shall live happily in harmony with our natural environment, guilt ridden "ecological footprints" being a distant memory.

Several of the interviewed companies cooperate with EPEA. Some companies because of the certification of their products, others are in a orienting phase where they need the expertise of EPEA. In the table below this is described further.

Involvement of EPEA in interviewed companies

Firm	Sector	Collaboration
1	Personal care products	Certification, full material assessments
2	Personal care products	Optimalization product, packaging and production
3	Agro and energy	Product development
5	Packaging & disposables	Certification
7	Industry	Product development
8	Solar Roofing	Process and products
9	Ceramics	First materials check
12	Office furniture	Certified products
13	Metalektro	Apply C2C in product development

Source: interviews and www.epea.com

7.2.5 – Conclusion general characteristics

In addition to the literature study an explorative research was carried out. 15 companies that are involved with C2C are interviewed. These are very different companies and different respondents, when looking at the size and sectors of the companies and the functions and experience of the respondents. Nine out of 15 had contacts with EPEA, the certifying institute. The products of 7 companies are suitable for the biological cycle, the other 8 companies have products that need to be recycled in the technological cycle. Four of the companies are small, 6 are middle-sized and 5 are considered as large companies, using the EU-standards. When making a rough distinction on sector, 4 firms are from the FMCG-sector, 3 from the chemical sector and 8 from the (manufacturing) industry.

7.3 Cradle-to-Cradle in the participating companies

In this paragraph the involvement of the participating companies with C2C will be studied. First the way in which the companies themselves say they are working according to C2C is analyzed, based on the remarks of the respondents, presentations from the companies, information from their websites and reports. In the next sub-paragraph is analyzed to what extent the companies work according to the C2C criteria as they are mentioned in the certifying guidelines, which is done by analyzing the scores on the first four questions about materials, recycling, energy- and water-usage and CSR. This paragraph ends with some final remarks.

7.3.1 C2C according to the respondents

Each of the companies that were involved in this research is involved with C2C in different ways and to a different extent. Some of the companies have an officially certified C2C product, some of the companies are orienting on the possibilities or are working on making one of their products C2C. In box 8.2 some examples are given of each of these phases.

Box 7.2 C2C activities in participating companies

In the interviews different companies told about their cradle-to-cradle related activities. Some companies already have a C2C certified product, others are trying to certify one of their products and others are still orienting on the possibilities. From each of these groups a quote is given:

Phase of C2C activities in interviewed companies

Firm	Phase	Quotes
4	Orienting	"Together with some students we are doing a project to analyze to what extent we can do something with C2C."
5	Certifying	"We are trying to get C2C certification for one of the products we sell, a compostable coffee-cup. The final target is to have a complete assortment of C2C certified packaging and disposables."
12	Certified	"All our products are developed according to the C2C principles. The top management supports it and it is present 'in the DNA' of our company. We cooperate a lot with other companies in the chain."

Source: interviews

Remarkably was the quote from the respondent from firm 10, who mentioned that C2C is misused often by 'green-washing' companies. He therefore stated: "C2C is an utopia, a long term philosophy. The concept is misused by many companies. You cannot work 'with C2C', but you have to have a C2C mindset."

7.3.2 - Score on C2C characteristics

As was described in chapter 6, the first four questions of the interviews contain the five main characteristics of the C2C certifying program. This was done to get a clear view on the degree in which the companies work with C2C, without asking for the respondents' opinion about C2C immediately. Just as in the certification criteria, the questions are divided in five areas, which are the way in which the company deals with toxic materials, the way in which the company uses recycling, the energy-usage, the water-usage and the social activities of the firm (referred to as CSR). For each of these areas some statements are made, on which the respondent could agree or disagree, using a 7-point scale, ranging from totally disagree (score: 1) till totally agree (score: 7) and everything in between.

In table 7.2 the questions are given once more, followed by the mean score on this question by all the respondents and the standard deviation. Because of the small amount of respondents and the different backgrounds, the standard deviation is quite big for most questions.

Table 7.2 - Mean scores on C2C aspects, interview question 1-4 (7-point scales, N=15)

	Question	Median	Mean score	Std. Dev.
1a	We minimize the use of toxic materials	7	6.00	1.65
1b	We search for alternatives for toxic materials	7	6.27	1.58
1c	Our products are (re)designed in such a way that they contain as few toxic materials as possible	7	5.53	2.20
1d	We use as much sustainable materials as possible	7	6.33	0.98
1e	We have developed a strategy to deal with the remaining toxic materials	7	6.00	1.65
2a	Our products are decomposable	6	4.93	2.31
2b	Our products are easy to dismantle	6	4.87	2.33
2c	Our products are designed in such a way that they are easily recyclable	6	4.87	2.23
2d	We have logistic processes to gather our products back for recycling	4	4.07	2.22
2e	We have a department for recycling	4	4.27	2.43
2f	We promote recycling of our product	4	4.33	2.47

Table 7.2 –(continued)

3a	We have developed a strategy for efficient energy usage	7	6.53	0.64
3b	We use solar energy in our production process	1	2.73	2.34
3c	We use solar energy in our whole company	1	2.33	2.19
3d	The energy use for recycling is taken in consideration in designing our product	5	3.87	2.39
3e	We have developed a strategy for efficient water usage	6	5.47	1.81
3f	Water that leaves the company is cleaner then when it entered	2	3.27	2.43
3g	In our production process we spare water	5	4.80	2.11
4a	We have a strategy for CSR	6	6.00	0.93
4b	Our employees are familiar with this CSR strategy	6	5.93	0.96

The mean scores for the questions 1a, 1b, 1d, 1e, 3a, 4a and 4b are quite high, the means for 3b, 3c and 3f are relative low. However, there is not very much that can be concluded about these outcomes yet, so in the next part of this paragraph the questions are combined for each of the five C2C-characteristics and analyzed per company.

To get an impression of the scores on the five C2C characteristics, the mean scores of the relating questions are calculated. Before doing this, first is analyzed if this is reliable, by using the Cronbach's alpha. The Cronbach alpha is a tool to estimate the average validity or homogeneity (Nijdam, 2003). When the combination of questions scores around a 0.7 or higher it is allowed to combine them. In table 7.3 these alphas are given.

Table 7.3 - Scores on C2C aspects, interview question 1-4 (7-point scales, N=15)

Cluster	Questions	Reliable? Cronbach's alpha	Score Mean	Std. deviation
Materials	1a, 1b, 1c, 1d, 1e	.724	6.02	1.35
Recycle	2a, 2b, 2c, 2d, 2e, 2f	.860	4.57	1.99
Energy	(3a), 3b, 3c, 3d	(.489) .651	5.53	2.05
Water	3e, (3f), 3g	(.680) .938	5.13	2.07
CSR-policy	4a, 4b	.779	5.93	0.85
C2C	All questions	.824	5.04	1.03

As can be seen in table 7.3, the Cronbach alphas for materials (.724), recycling (.860) and CSR (.779) are above 0.700, which is high enough to combine the questions. For the questions related to water the alpha is .680, which is almost sufficient. When looking at the alpha after deleting one of the questions, question 3f, an alpha of .938 is found. This is such a big difference, that a closer look to this question is needed. Question 3f asked if the water that leaves the company is cleaner than when it entered. This is a step that is only required for the higher C2C certificates, so it is not

very surprising that many companies score very low on this question. Therefore, without this question, the combined score for the C2C-characteristic 'water' is calculated.

The combined scores of the energy-related questions also give a low alpha (.489). Remarkably this is mainly caused by the question about the strategy for energy-savings. When this question is not included in the combined scores for this characteristic, the alpha still is not very high, with a score of .651, but now it comes near to the minimum of .700. Because the small amount of indicators, this alpha is sufficient to include this cluster of questions (Baarda, De Goede and Van Dijkum, 2003).

Besides the combined mean scores that are calculated for these five areas, also the total score on the questions related to C2C is calculated. The Cronbach alpha for all statements in question 1, 2, 3 and 4a and 4b is 0.824, which means that these questions can be combined in one mean score that gives the mean for the degree to which the participating companies work according to the C2C principles.

The mean of the combined scores on the five C2C characteristics and the mean of all statements on C2C are given for each company in table 7.4. The companies are rated according to their mean scores on the total mean C2C score, from high till low.

Table 7.4 - Scores on C2C per respondent (7-point scales, N=15)

Firm	Materials	Recycling	Energy	Water	CSR	C2C	Std. Dev.
12	7.00	7.00	5.00	7.00	7.00	6.60	0.82
8	7.00	6.00	6.67	6.00	5.00	6.35	0.75
6	7.00	7.00	3.67	4.50	7.00	6.05	1.57
15	5.50	4.80	5.67	5.50	6.50	5.45	0.76
2	7.00	5.20	2.33	7.00	6.00	5.40	2.19
7	7.00	6.60	3.00	1.00	7.00	5.40	2.64
13	7.00	5.00	3.67	7.00	6.00	5.35	2.18
10	5.00	6.40	1.67	4.00	5.50	4.65	1.79
14	6.50	4.00	1.00	7.00	6.00	4.55	2.58
11	5.25	3.00	5.67	3.00	6.00	4.45	1.57
1	7.00	4.80	3.00	1.00	5.00	4.45	2.46
3	7.00	1.00	1.00	6.00	5.50	4.20	2.76
5	2.50	4.60	7.00	7.00	7.00	4.00	3.08
4	4.75	1.00	2.67	6.00	4.50	3.60	2.46
9	4.75	2.20	1.00	5.00	5.00	3.30	1.89
Mean:	6.02	4.57	5.53	5.13	5.93	5.04	1.03

According to the outcomes of this table, some conclusions can be made, both about the general scores on the different C2C areas, and on the score for the different companies.

Cradle-to-cradle

Especially the areas of materials, water and CSR are given high scores by the participating companies. The area of recycling scores a little above average, which is remarkable, because of the important position that this aspect has in C2C. The average score on the C2C characteristic 'energy' is also quite low, although this can be explained because of the big position of solar-energy in the C2C certification criteria, and therefore in the statements in the interviews, while many of the companies use other kinds of sustainable energy or ways to save energy.

Companies

Companies that score high on C2C are firm 6, 8 and 12, all with scores above 6, which represented a strong agreement with the statements about C2C. The companies with a score between 5 and 6, firm 2, 7, 13 and 15, also agree with these statements, and have a clear connection with C2C. The remaining companies have a score between 3 and 5, which stands for a more or less neutral attitude. These companies are interested in aspects of C2C, but not on all areas of the certification criteria, or are in a very early stage of adoption of C2C.

7.3.3 Concluding remarks

All the companies are in some way involved with C2C, varying from a company in an early orienting phase in which the company is analyzing if there are possibilities to implement C2C in its own business, to a company that started 15 years ago with C2C materials and which best sold article world-wide is officially C2C certified, with many collaborations within its chain. On average, the 15 companies scored a 5.04 on a 7-point scale for C2C, which is a positive result.

7.4 Results per organizational level

In chapter 6 is explained that the first four questions from the questionnaire not only refer to the C2C criteria, but also to the three organizational levels; the strategic, organizational¹ and process-level. For each of these levels questions are included in the interviews that referred to these levels, although they were not explicitly mentioned. In table 7.5 the results for the mean scores on these questions are given.

Table 7.5 - Scores on organizational levels per question (7-point scales, N=15)

	Strategy		Organization		Processes	
	Questions	Score	Questions	Score	Questions	Score
Materials	1e	6.00	1a 1b	6.00 6.27	1c 1d	5.53 6.33
Recycling	2f	4.33	2e	4.27	2a 2b 2c 2d	4.93 4.87 4.87 4.07
Energy	3a	6.53	3b 3c	2.73 2.33	3d	3.87
Water	3e	5.47	3f	3.27	3g	4.80
CSR	4a	6.00	4b	5.93	4b	5.93
	Mean:	5.67	Mean:	4.40	Mean:	5.02
	Stdev:	0.84	Stdev:	1.67	Stdev:	0.80

The Cronbach's Alpha for each of these three combined mean scores is high enough to allow the combination of these questions, with respectively .879, .687 and .775. Each of the organizational levels will be analyzed further in the following sub-paragraphs.

7.4.1 –Strategic level

The questions related to strategy asked to what extent the company has developed a strategy for the use of toxic and hazardous materials, for the recycling of their products, for the energy and water usage and for CSR. The mean scores indicated that most of the respondents scored relatively high on the strategy for materials (6.00), the strategy for efficient energy use (6.53) and strategy for CSR (6.00). The mean score on strategy for efficient water usage is a little lower, but still quite high (5.47). The score for recycling is just above neutral, with a 4.33. The related question asked to what extent the company had developed a strategy for promotion of recycling of its products. Companies could agree or disagree upon this, using a 7-point scale, where '1' represented a strongly disagreement, and '7' a strong agreement. A score of '4' is thus a more or less neutral attitude towards this question. In this case this is not a very good representation of the answers on this question, because they were not normally distributed. In table 7.6 the score on this question is given for each of the participating companies.

¹ Here the organizational level is meant, as one of the three managerial levels. This shouldn't be mixed up with the questions related to the organizational structure, which are mentioned in the next paragraph.

Table 7.6 - Score on 2f – Firm promotes recycling of its products
(7-point scale, 1=not at all, 7 = very much, N=15)

Firm	Sub-sector	Sector	Cycle	Score
5	Packaging & disposables	Industry	B	7
6	Waste management	Industry	B	7
7	Industry	Industry	B	7
10	Technics	Industry	T	7
12	Office furniture	Industry	T	7
8	Solar Roofing	Industry	T	6
13	Metalektro	Industry	T	5
2	Personal care products	FMCG	B	4
11	Painting and maintenance	Chemic	T	4
15	Infrastructure and consultancy	Other	T	4
9	Ceramics	Chemic	T	3
1	Personal care products	FMCG	B	1
3	Agro and energy	FMCG	B	1
4	Horticulture	FMCG	B	1
14	Glass and metal	Chemic	T	1
			Mean:	4.33

The mean score of 4.33 here shows to be strongly divided over the different firms. Therefore, it is better to analyze the individual results. It shows that especially the companies that produce products that can be considered as fast moving consumer goods score low on this question. This is not very surprising, because these products are often biological degradable, so they automatically return in their biological cycle at the end of their lifecycle. However, not all products that return in the biological cycle score low. Three of the companies with products that are from the biological cycle gave the highest score that was possible, a 7. These companies have products that do not automatically return in the biological cycle, but have to be disassembled first, or that still have so much value as a raw material, that these companies want the products back. The products from firm 5 and firm 7 are made from biological materials, such as potato-starch and bioplastics, which can be reused if treated properly. When the bioplastics are mixed up with other plastics, it is not possible to reuse it for the same purposes, so it is important to recollect these materials separate from other waste-flows. These two companies therefore developed a strategy to recollect their products at the end of their lifecycles, and process the old materials to new products. Also firm 6 does this, they even visit the consumer to gather the old products and deliver the new products. Further remarks from the respondent and information from this company from other sources also learned that they have advanced systems to recollect their products. This is done by selling the service of the product, instead of the product itself. See also the example in box 7.3.

Box 7.3 Services instead of products

Firm 6 offers an 'exclusive exchange door-to-door service for kitty litter boxes'. This concept is based on a biological life cycle using a specially designed cat litter pellet. This pellet has a long activity period and is made of organic garden and kitchen waste originating from the same households. After use it is collected by the firm, and replaced with a new one. The used litter box serves as a soil fertilizer.

The 'kitty litter' life cycle stands for:

- Renewable raw material – upcycling
- Natural ingredients – active components
- End-user convenience → never clean the cat litter box yourself
- Producer responsibility and reverse logistics

Source: interview, press brochure and website

Firm 10 and 12, also with a high score on question 2f, produce products that can easily be recycled and that are even designed to be recycled. This makes it important for these companies to get their products back at the end of the lifecycle, which resulted in the highest possible score on this question for also these two companies. This needs a sophisticated recycling program. In box 7.4 this is explained further for firm 12.

Box 7.4 Steelcase

Firm 12, Steelcase, produces C2C-certified office furniture. Recycling and reuse are crucial in the cradle-to-cradle process. The products are designed in a way that they contain no toxic materials and can easily be disassembled. However, at the end of the product's lifecycle, the customer needs a method to deal with its old furniture. Steelcase developed a special program for this, the Steelcase Environmental Partnership Program.

This program provides environmentally responsible options for Steelcase furniture no longer wanted or needed. There are several alternatives, depending on the type, quantity and condition of the furniture:

Recycling and/or Reselling to other businesses

For large amounts of furniture (more than 50 furniture items) that are no longer needed, the company can let Steelcase recycle or resell it. Whether recycled or resold, it is helping the environment and saving the costs of landfill disposal fees.

Donating to a non-profit organization

For small amounts of furniture (less than 50 items) that are no longer needed, the company can donate to a non-profit organization that has an established program for accepting Steelcase furniture.

Refurbishing to extend the investment

Refurbishing and adding new components to a Steelcase workstation can extend the life of the customers furniture investment, helping to get additional use out of it while helping the environment too. Steelcase cooperates with Van Gansewinkel, who gathers the old Furniture.

Example of C2C product

In 2004, Steelcase became the first company to market a product meeting McDonough Braungart Design Chemistry criteria (MBDC): the Think chair. The chair can be dismantled in five minutes, while 99% of it can be recycled. Toxic substances such as cadmium and mercury are no longer used.

Source: interview, presentations and www.steelcase.com

The companies with scores around the average are often in a very early stage of cooperation with EPEA (firm 13 and 15), are still orienting if they want to work with C2C (firm 9 and 11) or have a strategy for the recycling of their raw materials, but not specifically for their own products (firm 2). Firm 14 scores very low, but is also in an orienting stage, where they are not sure whether to start with C2C or not. In box 7.5 some additional quotes are given about the strategic implications of C2C with respect to stakeholders.

Concluding, the score on strategy is negatively influenced by some companies for which this question is less relevant, because their products automatically return in the (biological) cycle, so they do not have to take care of the recycling of these products themselves. Taking this into account, the result for the scores on the strategy-related questions is quite positive, with almost a 6 on the 7-point scale.

Box 7.5 Stakeholders and chain management

Some of the interviewed firms gave examples of how they cooperate with their stakeholders. In this thesis this is seen as part of the strategic level of the firm; the level where the external relations are managed.

Stakeholder orientation because of C2C activities in interviewed companies

Firm	Quotes
1	We have taken different actions in social responsiveness, for example by volunteer projects like cleaning up a centre for homeless people
2	We are closing the product cycle in cooperation with our stakeholders. We have extensive discussions with the province and our suppliers, but we also want our customers to cooperate, so we can realize a closed products life cycle. C2C contributes to more stable chains We redesign our C2C supply chain.
9	We source 85% of our natural raw materials from local distributors.
10	We work together with our stakeholders to implement eco-effective products.
11	We cooperate with 4 other companies to find solutions for the environmental problems in our sector, such as the toxic elements in paint. Together it was possible to find a producer that is developing C2C paint.
12	We cooperate a lot with other firms in the chain, both horizontal and vertical.
15	At this moment we are involved in a project where we use the knowledge of different firms to develop a C2C energy-plant.

The relation with stakeholders due to C2C activities is an important element of C2C. The mean score on the social activities of C2C is 5.93 on a 7-point scale, which is quite high.

Source: interviews, company presentations and the companies' websites

7.4.2 - Organizational level

The questions related to the organization gave many different mean scores. The questions that asked about the minimalisation of the use of toxic materials, the efforts to search for alternatives for toxic materials and the awareness of the CSR-policy by the employees scored relatively high, with respectively 6.00, 6.27 and 5.93. Two questions had a more or less neutral mean, the question about the presence of a department for recycling (4.27) and the cleanness of the water that leaves the company (3.27). The last two questions related to the organizational level scored low. Both of these questions referred to the use of solar energy, both for the production process (2.73) and in the whole company (2.33). Especially these two questions have a negative impact on the total mean on the organizational questions. In § 7.3.2, where the scores on the C2C aspects were analyzed, is already mentioned that this can be declared by the strong focus from C2C on solar-energy, while many of the companies use other sustainable energy-sources such as solar-energy and algae or have other energy-saving projects. In box 7.6 an illustration of energy out of algae is given. Nevertheless, C2C claims that solar-energy is the best way to generate sustainable energy, so these questions were included in the interviews.

Also question 3f, the question about the quality of the water that leaves the company scored low. According to C2C, water that leaves the company should be cleaner than when it entered the company. This is one of the most far-going elements of the C2C certification criteria related to the water-usage.

The scores on the organization-related questions are not very high, with a mean score of 4.28, a score just above 'neutral'. When the solar-energy related questions are not taken into account, the mean score on the organizational related questions is a 5.15.

Box 7.6 Algae

The cradle-to-cradle concept focuses on solar-energy as the solution for the increasing energy-need. However, there are more methods in which a company can generate 'green' energy. An example is by generating energy out of algae. Both firm 3 and firm 15 work with algae as energy-source.

Example of algae project

Firm 15 works together with algae specialists to convert waste into nutrients. In this project expertise in the areas of growing algae, treating waste water and generating energy is combined with the expertise of firm 15 on engineering and project coordination. The project utilizes the cradle-to-cradle principle. The residues from a variety of industries (such as food, waste water purification and livestock farming) are considered to be 'feed' rather than waste. Algae can convert these wastes to high-grade biomass, biodiesel or energy.

The organization is working with water boards, industries and farmers to find solutions to their waste problems. Discussions are currently taking place with a number of industrial companies and water boards in regard to developing this project in a real working company.

Source: interview, presentations and website

7.4.3 - Processes

The questions related to the processes of the company asked mainly about the design of the products. The participating companies were asked if they designed their products in such a way that they contain a minimum of toxic materials, to what extent sustainable materials and products are used, if the products are recyclable or decomposable, if the products were easy to disassemble and if they are designed to be easily recycled. Also the logistic processes to take back the products for recycling are part of the process-level, just as to what extent the energy-use needed for recycling is taken into account in the design of the products. The extents in which the company tries to save water and to what extent the employees are aware of the CSR-standards of the company are the final questions related to processes. In table 7.7 the results are given.

Table 7.7 - Total mean scores on questions related to process-level
(7-point scale, 1=not at all, 7 = very much, N=15)

	Question	Median	Mean score	Std. Deviation
1c	Our products are (re)designed in such a way that they contain as few toxic materials as possible	7	5.53	2.20
1d	We use as much sustainable materials as possible	7	6.33	0.98
2a	Our products are decomposable	6	4.93	2.31
2b	Our products are easy to dismantle	6	4.87	2.33
2c	Our products are designed in such a way that they are easily recyclable	6	4.87	2.23
2d	We have logistic processes to gather our products back for recycling	4	4.07	2.22
3d	The energy use for recycling is taken in consideration in designing our products	5	3.87	2.39
3g	In our production process we save water	5	4.80	2.11
4b	Our employees are familiar with the social strategy	6	5.93	0.96

The scores for the C2C-characteristic 'materials' are quite high, with scores around 6 on the 7-point scale. This means that most of the companies are seriously searching for alternatives for toxic materials, and search for ways to ban toxic and hazardous materials from their products. Also the score on the CSR-related question scored high, which means that the employees are familiar with the CSR-policy of the company. This gives an indication of how the strategy and the processes align.

The scores for the questions about recycling and water-usage scored around a five on the 7-point scale. This indicates a positive attitude towards these areas on the process-level, although the score is not very high.

The question about the energy-use, question 3d, scored relatively low, with a 3.87, just below the middle of the 7-point scale, which stands for an almost neutral. In table 7.8 the individual scores for this question are given.

Table 7.8 - Score on question 3d – Energy use for recycling of its products is taken into account in the product design (7-point scale, 1=not at all, 7 = very much, N=15)

Firm	Sector		Cycle ¹	EPEA ²	Score
1	Personal care products	FMCG	B	Yes	1
2	Personal care products	FMCG	B	Yes	5
3	Agro and energy	FMCG	B	Yes	1
4	Horticulture	FMCG	B	No	1
5	Packaging & disposables	Industry	B	Yes	7
6	Waste management	Industry	B	No	6
7	Industry	Industry	B	Yes	7
8	Solar Roofing	Industry	T	Yes	6
9	Ceramics	Chemic	T	Yes	1
10	Technics	Industry	T	No	3
11	Painting and maintenance	Chemic	T	No	5
12	Office furniture	Industry	T	Yes	5
13	Metalektro	Industry	T	Yes	3
14	Glass and metal	Chemic	T	No	1
15	Infrastructure and consultancy	Other	T	No	6
Mean:					3.87
Median:					5
Stdev:					2.39

¹: a “B” represents a biological cycle, a “T” represents a technological cycle (see § 7.2.2)

²: “yes” indicates that the company is officially working with C2C, in cooperation with EPEA (see § 7.2.3)

As one can see, the scores for this question are widely distributed, with scores from one till seven on the 7-point-scale. It is however hard to find a reason for this, because there is no clear group of respondents that score different from the others. When taking the mean for the companies with products in the biological cycle, which is 4.00, and comparing this with the mean for the companies with products in the technological cycle, which is 3.75, it shows that this difference is quite small. When comparing the companies from that officially work with C2C through EPEA, with a mean score of 4.00, with the companies that don't work with EPEA, with a mean score of 3.67, the difference is still too small to find a reason for the low mean score.

Besides the implications of the five C2C areas on the process-level, also the comparison with elements of existing environmental and quality care systems is investigated in the open questions in the interviews. In box 7.7 some of the main outcomes are given.

Box 7.7 Environmental and quality processes

In the literature study the firm's environmental and quality care systems were analyzed as part of the process-level. Some of the interviewed firms gave examples of how they use life cycle assessment (LCA) and other environmental and quality care systems in their processes and how they compare this with their C2C activities.

LCA and C2C in interviewed companies

Firm	Quotes
9	The hype for C2C is bigger than for systems like ISO 9001 and 14000. LCA is cradle-to-grave, so we goes beyond LCA and use C2C. Our products have a long life cycle, so C2C is more logic.
10	You cannot compare C2C and existing EMS's. C2C is a competitive tool one adopts voluntary, while existing EMS's are often obligatory.
12	We combine C2C with LCA, so the environmental impact on all levels is analyzed. In LCA we measure the impact on the environment in every stage of the product's lifecycle. LCA is a better way to improve environmental and financial performance, because measuring delivers knowledge.
13	We use LCA to decide which materials we use. We work with LCA since 1994, so C2C fits perfectly in our company. C2C should not come instead of other care systems, because they are used for other purposes.
15	C2C has more potential that existing environmental systems, both on environmental as on financial perspective.

The scores for the C2C-characteristic 'materials' are quite high on the process-level, with scores around 6 on the 7-point scale. The mean score is 5.93. This means that most of the companies are seriously searching for alternatives for toxic materials, and search for ways to ban toxic and hazardous materials from their products.

Source: interviews, company presentations and the companies' websites

7.4.4 - Concluding remarks

Concluding, the score on strategy is negatively influenced by some companies for which this question is less relevant, because their products automatically return in the (biological) cycle, so they do not have to take care of the recycling of these products themselves. Taking this into account, the result for the scores on the strategy-related questions is quite positive, with a small 6 on the 7-point scale.

The scores on the questions related to the organizational level, which are mentioned in table 7.5, are not very high, with a mean score of 4.28 on a 7-point scale, a score just above 'neutral'. When the solar-energy related questions are not taken into account, the mean score on the organizational related questions is a 5.15.

The questions on the process-level scored on average a 5.02. Especially the question about the energy-use for recycling has a negative impact on this average.

When comparing the mean scores for each of the three levels, it shows that they score quite diverse. The strategic level scores best, with a 5.67, the organizational level just above the neutral score with a 4.28 and the process level scores a relative positive score of 5.02. When analyzing the scores for each managerial level for each C2C area, the areas 'materials', 'recycling' and 'CSR' score more or less stable on all levels, which might indicate a strong fit between the three managerial levels. The scores on water and energy vary quite strong, which might be because of the relative far-going questions or the limited amount of questions.

It is important that all three managerial levels support the implementation of C2C. See also box 7.8 for the opinion of the respondents upon this.

Box 7.8 Support managerial levels

In this paragraph the importance of the different managerial levels is analyzed for companies working with cradle-to-cradle. In question 12 is asked to what extent the respondents agreed with the statement that cradle-to-cradle can only be successfully implemented when all managerial levels support it, using a 7-point scale. The mean score is high, a 6.33, which means that all companies claim the importance of a company-wide support. Unfortunately, there is no significant relation to a specific group of respondents for this question.

Question 12d (N=15)	Min.	Max.	Mean	Std. dev.
C2C can only be successfully implemented when all management levels support it	4	7	6.33	0.90

Source: interview

7.5 Results organizational types

In the interviews is asked for several organizational characteristics, to get an impression of which characteristics from Mintzberg's organizational structures (see also chapter 4) are present in the companies that work with C2C, and to learn what configurations from Mintzberg fit best with C2C. The characteristics that are included in the questions are position of the technocratic and supporting staff, the dynamics of the market and the innovativeness of the organization, the decentralization within the company and the investments on R&D. In chapter 6 is already explained which questions are used, in table 7.9 the results of these questions are given.

Table 7.9 - Score organizational characteristics
(7-point scale, 1=not at all, 7 = very much, N=15)

	Variable	Min.	Max.	Median	Mean	Stdev
4c	Technocracy	1	7	5	4.93	1.83
4d	Supporting staff	1	7	5	4.93	1.75
4e	Dynamic market	4	7	6	5.87	1.13
4f	Innovativeness	5	7	6	6.20	0.77
4g	Mutual adjustment	1	7	6	5.40	1.64
4h	Decentralization	3	7	6	5.53	1.25
5e	R&D investments	2	7	5	5.20	1.57

The score on innovativeness is the highest score amongst the means of the questions related to the organizational characteristics of the participating companies. With a mean score of 6.20 on the 7-point scale and a minimum score of five, it shows that the companies that participated in this research see themselves as innovative companies in their sectors. Remarkably, there is almost no difference in the mean scores for companies that work together with EPEA (6.11) and companies that don't work together with EPEA (6.33). This might be an indicator that it does not matter if the company makes its C2C efforts 'officially' or not, but that it is more important that the company is innovative in its sector. The same conclusion can be made for the different sectors and the different sizes of the firm, because all score almost equal. When comparing the means from the companies with products from the biological cycle (6.43) with the companies with products in the technological cycle (6.00) the difference is bigger, although still not very big. A reason for this difference may be that the companies that produce products that can return in the biological cycle are facing less competition on innovativeness in their sectors, while companies with products in the technological cycles are participating in sectors where many innovative companies operate, which is due to the more complex technological products.

Concluding, the scores on innovativeness are almost the same for each of the groups that can be distinguished. To some extent this can be seen as a positive bias, because all companies that are working with a new concept, such as C2C, are expected to be innovative, but the respondents were not selected on innovativeness, but only on their involvement with C2C.

A larger difference between the companies from the biological or the technological cycle, as they were described in §7.2.2, is the perceived importance of the technostructural staff. The mean for

the companies from the biological cycle (5.29) is higher than the mean from the companies from the technological cycle (4.63).

The literature study about the organizational structures according to Mintzberg in chapter 4 claimed that the organic structure or the machine bureaucracy would be the configuration in which C2C would fit best. These two configurations are more or less opposites, so it is expected that one of them scores better than the other. When combining the related questions, the mean score of the participating companies on these two configurations can be made. Combining these questions is allowed because of the Cronbach alpha of .793 for the organic structure and .728 for the machine bureaucracy. In table 7.10 these combined mean scores are given.

Table 7.10 - Score configurations (7-point scale, 1=not at all, 7 = very much, N=15)

Configuration	Included questions	Cr. Alpha	Min.	Max.	Mean	Stdev.
Organic structure	4d, 4e, 4f, 4g, 5e	0.793	4.20	6.80	5.52	0.91
Machine bureaucracy	4c, 4e, 4f, 4g, 4h, 5e	0.728	4.00	6.83	5.52	0.84

The mean result for both configurations is the same, with a mean of 5.52 on the 7-point scale. Therefore, it is hard to conclude that one of these configurations is better than the other, although it shows that both configurations score quite high. Both configurations therefore seem suitable for an effective adoption of C2C. In this explorative research elements of other configurations were not included, so it is not possible to find another configuration to compare the scores with.

Box 7.9 Correlations C2C and organizational types

The total mean score that is calculated for the Mintzberg configurations organic structure and machine bureaucracy are compared with the total mean score on C2C and the five C2C characteristics. The machine bureaucracy scores a .538 ((Pearson correlation, N=15, sig. (1-tailed) = 0.019), the organic structure a .376 (Pearson correlation, N=15, sig. (1-tailed) = 0.084). It is obvious that there is a correlation between these configurations and the score on C2C, but this correlation is not very strong and it is not possible to specify this for any group of respondents. What however does show up, is the correlation of these two configurations with the combined mean scores of C2C-characteristics. The correlation with the characteristics 'recycling' and 'CSR' is significant, the correlation with the other three characteristics is not. A possible reason is found in the backgrounds of the participating companies. Dividing the respondents in companies that also offer services and those who don't, gives a significant correlation with the configurations. The correlation with the machine bureaucracy is .575, the correlation for the organic structure is .644 (Pearson correlation, N=15, sig. (1-tailed) = 0.012 en 0.005 respectively). Companies that also offer services will focus more on the social elements of the C2C-concept, because the other four C2C elements are more focused on production.

The differences between the two configurations are very small on the average score, although it does differ for the correlations with C2C. The machine bureaucracy has a more significant and higher correlation with C2C compared with the organic structure, that does have a stronger correlation with the social aspects of C2C.

When analyzing if these configurations get a better score by one of the different groups of companies that can be distinguished, it shows that the scores have very small differences between all these groups. There is no significant difference for companies from different sectors, size or life-cycle. Therefore, when analyzing which organizational types, 'organic structure' and/or 'machine-bureaucracy', fit the best in C2C, there cannot be made a distinction between the different companies. Statistical tests did not give significant results for the relation with C2C either¹. In box 7.9 the significant correlations between the scores on C2C and the configurations are mentioned².

¹ See appendix 4 for the related Mann Whitney U-test

² In appendix 2 the correlation table is given

7.6 Results financial performance and C2C

In the interviews was asked about the opinion of the respondents about the financial consequences of their current environmental systems and more specifically for C2C. In table 7.11 the scores on these questions are given. In the following sub-paragraphs will be dealt with these figures.

Table 7.11 – total Mean scores on perceived influence EMS / C2C on financial performance (7-point scale, 1=strongly disagree, 7 = strongly agree, N=15 (EMS) and N=13 (C2C))

		Question		Current EMS	C2C related
5a	13a	Costs	Cause for administrative costs	3.47	3.08
5b	13b	Costs	Cause for extra labor costs	3.53	3.57
5c	13c	Costs	Cause for investment costs	3.80	4.14
			<i>Mean:</i>	3.60	3.60
			<i>Stdev:</i>	<i>0.88</i>	<i>0.53</i>
6a	14a	Benefits	Influence on price	3.13	4.23
6b	14b	Benefits	Influence on turnover	4.00	4.85
6c	14c	Benefits	Influence on cost-savings materials and energy	4.69	5.31
6d	14d	Benefits	Influence on cost-savings waste treatment	4.57	5.15
6e	14e	Benefits	Influence on productivity	4.73	4.55
6f	14f	Benefits	Influence on subsidies	4.75	4.20
6g	14g	Benefits	Influence on image	6.40	6.31
			<i>Mean:</i>	4.61	4.94
			<i>Stdev:</i>	<i>0.98</i>	<i>0.74</i>
5d	13d	Results	Costs higher than benefits	2.47	2.38
7	15	Results	Investments depended on financial performance	4.27	4.33

7.6.1 Costs

As was presented in table 7.11, the respondents were asked for their opinion about the costs that occur as result of their environmental care (question 5a-5c) and more specific as result of C2C (question 13a-13c). In the interview three kinds of costs were defined; the extra administrative costs, the extra labor costs and the costs for the investments in the environmental care system or C2C activities.

Most companies give a neutral or negative score on the costs caused by their environmental efforts and C2C. Firm 12 even states: *“Costs related to training and administrative tasks are ignorable when looking at the benefits”*. The expected costs are supposed to be mainly in investment costs, which is due to the new production processes that might be needed. Overall, the score for the (expected) costs as a result of EMS and C2C are the same: 3.60 on a 7-point scale, which is a little below the neutral score. So, based on these questions, it is not possible to say that C2C leads to substantial higher costs than existing environmental measures.

7.6.2 Benefits

In table 7.11 the mean results for the questions on the benefits of the environmental efforts of the companies were given. In the interviews the same questions were asked twice, once for the environmental efforts that the company already had (question 6a-6g), and once specific aimed at the ideal C2C company (question 14a-14g). The question asked to what extent the current environmental care system / C2C activities have a positive influence on the financial performance. Companies could give a score from one till seven, where one stood for very little influence, and seven for very much influence. Companies for which the mentioned aspects were not relevant could also mark “n/a”. The aspects on which the companies were asked to give their opinion were the price of the product, the turnover, the cost-savings materials and energy, the cost-savings waste treatment, the productivity, the received subsidies and the image of the firm. In box 7.10 some quotes are given in relation to the perceived benefits.

Box 7.10 Benefits

The respondents were asked what their experiences are with the profitability of cradle-to-cradle. Although many of the respondents had no experience with this, some of them had some examples of how they experienced the benefits of cradle-to-cradle already.

Quotes about benefits C2C

Firm	Sector	Quote
5	Packaging & disposables	"We have benefits via PR and increased image"
6	Waste management	"We have no experience on the benefits yet, but we get many positive reactions on our products, so we keep believing in it and continuing our projects"
7	Industry	"At this moment especially the attention and promotion because of our C2C product is great. This definitely has a positive influence on our image". "Producing according to C2C is not more expensive than the regular way."
13	Metalektro	"It is obvious that customers demand C2C products. We know we can make it profitable. Recycling of products attract new customers, which we do".

Source: interviews

The benefits will be especially big on image and cost savings, as is showed in table 7.11. C2C has more influence on the price of the products than the current environmental measures, but the expected influence on subsidies is lower for C2C. Reason for this may be that governments do not yet have subsidies for C2C investments. Overall, more benefits are expected for C2C than as result of the current environmental management systems. As firm 15 states it: "*C2C has more potential*". What however is remarkable is that the scores for C2C compared to the scores of the current environmental management systems are higher regarding the benefits as result of price, turnover and cost-savings, but lower for the benefits as result of productivity, subsidies or image. An explanation for the different score on image might be found in the fact that the existing environmental management systems are more well-known by the consumer, while C2C is relatively new and not many people are already familiar with it. Also for subsidies an explanation can be found, because government has several subsidies for existing environmental measures, but not (yet) for C2C.

Remarkably is that the score on 6b/14b, the increase of turnover, is relative low, while the score on cost-savings, productivity and especially increased image is higher. This might indicate that the companies expect extra benefits as result of their C2C efforts, but are not (yet) able to translate this in an increased turnover.

In box 7.11 is explained that the cost-savings will be found in efficiency benefits.

Box 7.11 Efficiency benefits

The only significant correlation score from a financial cluster in relation to the C2C cluster is found for the benefits as result of the current C2C measures (Pearson correlation = .463, N=15, sig. (1-tailed) = 0.041). When focusing in more detail on the main elements that cause the benefits, the cost-savings and productivity have a significant correlation with C2C. This indicates that the expected benefits of C2C will be found in the efficiency-related benefits.

Correlations C2C and cost savings and productivity				
		Score C2C	Cost savings	Productivity
Score C2C	Pearson Corr.	1		
	Sig (1-tailed)			
	N	15		
Cost savings	Pearson Corr.	.432(***)	1	
	Sig (1-tailed)	.054		
	N	15	15	
Productivity	Pearson Corr.	.581(*)	.618(**)	1
	Sig (1-tailed)	.012	.007	
	N	15	15	15

* Correlation is significant at the 0.05 level (1-tailed).

** Correlation is significant at the 0.01 level (1-tailed).

*** Correlation is significant at the 0.10 level (1-tailed).

7.6.3 Financial results C2C

In the previous sub-paragraphs questions about costs and benefits were analyzed separately, both for the current environmental efforts and for C2C. One question that also was asked for both situations, was whether the costs or the benefits are higher. These questions were formulated as statements, which could be agreed or disagreed with, using a 7-point scale where '1' stood for 'not at all', and '7' for 'totally agree'. The first question referred to the costs for environmental care (question 5d), the second for the costs for C2C (question 13d). In table 7.12 the outcomes for these questions are given for all companies.

Table 7.12 - Score on question 5d/13d – Costs for EMS / C2C higher than benefits (7-point scale, 1=totally disagree, 7 = totally agree)

Firm	Sector		Cycle	Score EMS	Score C2C
1	Personal care products	FMCG	B	2	2
2	Personal care products	FMCG	B	1	3
3	Agro en energy	FMCG	B	1	n/a
4	Horticulture	FMCG	B	6	2
5	Packaging & disposables	Industry	B	2	2
6	Waste management	Industry	B	4	3
7	Industry	Industry	B	1	1
8	Solar Roofing	Industry	T	4	n/a
9	Ceramics	Chemic	T	2	4
10	Technics	Industry	T	4	4
11	Painting and maintenance	Chemic	T	2	2
12	Office furniture	Industry	T	1	1
13	Metalektro	Industry	T	2	2
14	Glass and metal	Chemic	T	2	2
15	Infrastructure and consultancy	Other	T	3	3
			Mean:	2.47	2.38
			Stdev:	1.46	0.96
			Median:	2	2

When analyzing the results it is clear that the scores on these two questions are relatively low for almost all companies, which means that the respondents disagree with the statement that the costs for their environmental measures / C2C are higher than the benefits. In other words, the lower the score, the more companies expect that the benefits from their current environmental care system or from C2C will be higher than the costs. Two companies did not answer the question about C2C; “the costs for cradle-to-cradle are higher than the benefits”. They did not answer this question because *“too less is known about the financial consequences of cradle-to-cradle to give a reliable answer”*. The other 13 companies did not all have much experience with the financial consequences of C2C neither, but were willing to give their opinion. On average, the scores for the question on C2C is a little lower, although this difference is very small. When looking at the individual results, there are two companies, firm 2 and firm 9, that expect an increase of the costs for C2C in comparison to their current environmental care systems. These two firms already have a sophisticated environmental care program and are now aiming for C2C certification for some of their products, so the extra costs they expect from C2C are partly for the certification process. Firm 2 states: *“At this moment we are positioning ourselves in the C2C market, later we expect more costs. C2C is still a quite new concept, in the end it will lead to more stable and cheaper chains, but it needs costs before the benefits can grow.”* The largest difference is found at firm 4, which gives a score of ‘6’ for their current environmental care systems, which means that they experience more costs than benefits from it, and a score of ‘2’ for C2C, where the costs are much smaller than the benefits. This company is in an orienting phase with regard to C2C, but expects that it will be more beneficial than their current environmental care system. They invested a lot in their current system, which also caused high administrative and labor costs. However, many of these investments are also useable for C2C purposes, for example in their investments in solar energy.

When comparing the results for the companies that score high on C2C and the companies that score lower on C2C, it shows that the companies with a high C2C score give a lower score on this question. Therefore, it might be assumed that companies that work more with C2C expect more benefits from C2C than costs. Testing this with a Mann-Whitney U-test however does not give significant evidence, so it cannot be proven. In appendix 4 the results of this test are given.

Concluding, it is assumed that C2C leads to increased financial performance, although this is not yet measurable. However, the scores on the expected benefits are higher than the scores on the expected costs, and the score on the question if the costs are higher than the benefits is strongly disagreed upon.

7.6.4 Influence financial performance on C2C investments

Question 7 and 15 also asked about the influence of the financial performance on the investments in environmental care systems and C2C activities. The questions were stated as follows:

- 7: To what extent are the investments in environmental measures in your company dependent on the financial performance of your company? (question 7)
- 15: If you work with C2C, or would consider it, to what extent would the investments in C2C be dependent on the financial performance of your company? (question 15)

The question could be answered using a 7-point scale, where ‘1’ represents ‘totally independent’, and ‘7’ represents ‘totally dependent’. In table 7.13 the scores on these questions are given, sorted on the score on question 15.

When analyzing the question if the investments in C2C are dependent from the financial performance of the firm, there is a clear distinction between the small- and medium-sized companies, and the large companies. The small companies give a mean score of 4.00, which is neutral; they do not agree nor disagree with the statement. Medium-sized companies give a mean score of 3.67, which is a little below the middle, so they very subtly disagree with the statement. The large companies however have a mean score of 5.40, which is clearly a high score, which means that they on average strongly agree with the statement, or, in other words, that they let their investments in C2C be depended from their financial performance. However,

when using a Kruskal-Wallis test, the significance for this is not supporting this, so it cannot be proven yet. In appendix 4 the test results are given. Because this research is explorative, this might be investigated further in future research.

Table 7.13 - Score on question 7 and 15 – Investments in EMS / C2C depend on financial performance (7-point scale, 1=totally disagree, 7 = totally agree)

Firm	Sector		Size	Score EMS	Score C2C
1	Personal care products	FMCG	M	6	2
14	Glass and metal	Chemic	M	6	2
7	Industry	Industry	S	1	3
5	Packaging & disposables	Industry	M	2	3
2	Personal care products	FMCG	M	3	3
6	Waste management	Industry	M	3	4
11	Painting and maintenance	Chemic	M	4	4
3	Agro en energy	FMCG	S	6	4
12	Office furniture	Industry	L	3	5
13	Metalektro	Industry	L	3	5
10	Technics	Industry	L	4	5
9	Ceramics	Chemic	L	5	6
15	Infrastructure and consultancy	Other	L	5	6
4	Horticulture	FMCG	M	6	6
8	Solar Roofing	Industry	S	7	7
Mean:				4.27	4.33
Stdev:				1.75	1.54
Median:				4	4

Concluding, with a mean score just above the middle of the 7-point scale, it is hard to conclude to what extent companies depend investments in C2C on their financial performance. Also the backgrounds of the companies give no reason to expect a clear reason for these scores.

7.6.5 Concluding remarks financial performance

The participating companies expect that the benefits of C2C will be higher than the costs that are needed for the adoption of the concept. However, most of the companies are in such an early stage that they do not have experience with the financial consequences. Firm 10 says: *“There are almost no financial figures available about C2C, this should be investigated later, when more companies work with it and more C2C products are available on the market.”*

About the comparison with existing environmental care systems they say: *“You cannot compare them, because C2C is something a company implements voluntary, while other environmental tools are obligatory.”* Firm 13 states: *“C2C is a way to reach the goal of being CSR. C2C should not come instead of other care systems, because they are used for other purposes.”*

Concluding; the expected positive influence of C2C on the financial performance is showed in the mean scores on benefits and costs, and will be found in cost-savings and increased image, but the influence of financial performance on C2C is not clear.

7.7 Conclusion

In this chapter the results of the interviews are analyzed for each area of the research questions. The interviews are explorative, which means that they are not used to find reliable answers on theories and hypotheses, but to get an impression of the way in which companies that already work with C2C perceive the influence of C2C on the firm, the financial performance and of the kind of organizations that work with C2C.

The interviews were conducted amongst companies with experience with C2C. Some were in an orienting phase, others already had C2C-certified products. The participating companies have very different backgrounds, in sectors, size and involvement with C2C. Because this research is explorative, this does not matter. The companies gave especially attention to the C2C principles on the areas 'materials', 'social policy' and 'energy', a little less on 'water' and 'recycling'.

When dividing the C2C activities of the participating companies in activities per managerial level, it shows that especially the strategic level scores high. The questions related to the organizational level scored lower, the process level scored in between, with a score equal to the total score on C2C. This shows that the participating firms give relatively much attention to C2C on the strategic level, but that it is not yet completely translated to the organizational and process level.

The organizational structure of the participating companies was investigated with the use of characteristics from Mintzberg's configurations 'organic structure' and 'machine bureaucracy'. Especially the scores on innovativeness, dynamic markets and decentralization scored high, which points in the direction of the organic structure.

Although this is an explorative research, it still was hard to find information about the financial consequences of C2C. Most of the participating companies did not have a clear view on the financial aspects of their C2C activities, because the implementation of C2C is still in a very early stage. However, the companies expected that the benefits of C2C will be higher than the costs, and that C2C will especially have a positive influence on the cost-savings and the image of the firm.

When analyzing the reactions of the respondents upon the different conclusions from the literature study that were given in figure 6.2 and table 6.1, not all conclusions can be supported with the interview results. However, in table 7.14 the elements that are agreed upon are marked. All elements on which the respondents gave a high score are made bold.

Table 7.14 – Matrix different main conclusions literature study

	Type I companies	Type II companies
Strategy	Prospector	Defender
Organization	Decentralized Mutual adjustment Organic structure	Centralized Top-down Machine bureaucracy
Processes	Flexible Innovative Process change	Non-flexible Procedures stable Process control
Financial aim	Image revenues	Cost savings

As one can see, especially the findings of the 'type I' companies are supported. However, this can also be caused by the fact that especially 'type I' companies are interviewed, so a final conclusion needs to be made with help of both the literature study and the interviews, in chapter 8. It also showed that not all research questions can be answered. Reasons for this might be found in the small group of respondents, the diverse backgrounds of the respondents and the quality of the data. However, with help of the information from the literature study, the next chapter will give the final conclusions and discussions.

Chapter 8 Conclusion and discussion

8.1 Introduction

In this chapter the results from the theory study and the interviews will be combined in order to answer the research sub-questions and the main research question. This is done in §8.2. In §8.3 the results and the methodology used in this research are discussed, to come to some topics for further research.

8.2 Conclusions

This thesis is an explorative, qualitative desk-research, so the main focus was on the literature study. In chapter two till five different theories are studied to get an insight in the complex area where C2C could be introduced. This was done with the research questions in mind, while focused on five areas; C2C, strategy and stakeholders, the organization, the processes and financial performance. With help of the sub-questions was tried to find an answer on the main research question. In the interviews additional information was gathered. In this paragraph the results of the literature study and the interviews are combined to come to a conclusion, which is first done per sub-question. Then a conclusion is made upon the best characteristics of the companies that want to adopt C2C. To conclude this paragraph the conclusion for the main research question is given.

8.2.1 – Conclusions upon the research sub-questions

Cradle-to-Cradle

What is the cradle-to-cradle methodology? Literature research in chapter 2 shows that C2C is a concept aiming at the elimination of waste by completely recycling the product's materials, without loss of quality, in their biological or technological life-cycles, while focusing on environmental, financial and social goals.

How is cradle-to-cradle related to environmental management systems? C2C is compared with existing environmental management systems. C2C can be compared with elements of innovative environmental management systems that focus on the prevention of waste by product- or process-change. Environmental measures that fit this description are product- or chain oriented.

What are motives for cradle-to-cradle? Motives for C2C are divided in environmental and financial motives. However, there is no prior research for the financial motive, so there is more focused on the financial effects of existing environmental management systems. The interviews showed that companies expect financial benefits from C2C, so this motive is present.

Strategy and stakeholders

How does C2C fit in existing theories about strategy? In § 3.3 the five forces of Porter, the Resource Based View and the four categories of companies that Miles and Snow defined are described. From these categories, the defenders and the prospectors are the categories for which reasons for adopting C2C were found. Defenders are the most likely to adopt C2C for reasons of cost-savings. The prospectors are the most likely to adopt C2C because of increasing revenues and image. Because of the innovativeness that is required for C2C, it is expected that from these two types, the prospectors will be the first to adopt C2C.

How does strategy align stakeholders and organization? Alignment can be studied from many different perspectives, as was showed by the model of Venkatraman and Camillus in § 3.4. Important for managerial decisions is to know what the domain of the alignment is. This can be internal, external or integrated, whereas the integrated domain seems to have the most similarities with C2C. The integrated domain combines the internal fit, which is the fit between all managerial levels, and the external fit, which is the fit between the company and its stakeholders. The internal part of the integrated fit is necessary for C2C, as is explained in chapter 2. C2C needs to be supported by the whole company. In chapter 3 is explained that the strategic level needs to support C2C, in chapter 4 the importance of the support of the organizational- and

process level is explained. The interviews showed that the scores on the three organizational levels correlated strongly with each other. All companies gave a high score on the question whether managerial fit was needed for an effective implementation of C2C. This suggests a relatively strong internal fit.

The external part of the integrated fit is shown in chapter 2 and 3. In chapter 2 is mentioned how C2C contributes to all three main areas of stakeholders interest; financial, ecological and social. In chapter 3 is explained how C2C contribute to the relation with the stakeholders. This is also explained in the last research sub-question of this paragraph.

What is the role of stakeholders in the environmental awareness of companies? Literature showed that stakeholders influence the environmental awareness of the company. Especially the role of the consumer is important (Polonsky and Ottman), although the most direct influence is perceived to come from governments (Madsen and Ulhoi).

What contribution does C2C make towards stakeholder goals? In the literature study in chapter two, the fractal triangle is mentioned (figure 2.3). This triangle represents the financial, environmental and social aspect of C2C. C2C aims to focus on all three of these aspects, and therefore will contribute to the stakeholder goals.

C2C and the organization

How can organizations be characterized? Literature showed in chapter five that there are three managerial levels. Strategy, which is described in chapter three, the organization and the processes, both described in chapter 4. Besides these managerial levels, the organization can be characterized in many different ways. A well-known example is the characterization of Mintzberg, which is used in this thesis. In § 4.2 the characterization of Mintzberg is analyzed. From these characterizations, the organic structure and the machine-bureaucracy fit most in the C2C characteristics. These two configurations are opposites of each other; both have different aspects that might be suitable for C2C. In relation to the analysis of chapter 3, the machine bureaucracy has elements of the defenders, the organic structure has more elements of the prospectors.

What characteristics are stimulating C2C? Especially the technological staff and the supporting staff need to be well-developed in a C2C company. Important elements such as strong technocracy, innovativeness, decentralization and flexibility are needed because of the often complex redesign of the product and the production process, as was described in chapter 2. Chapter 4 states that the configurations that fit best in C2C are the machine bureaucracy and the organic structure. The interviews showed that companies working with C2C score high on both configurations. Both configurations have a significant correlation with the scores on C2C, so both configurations seem to be suitable for C2C. However, the interviews showed that the companies consider themselves as innovative, decentralized and dynamic, so it is expected that the best configuration should meet these characteristics. The literature study shows that these characteristics seem to be more present in the organic structure.

C2C and organizational processes

What organizational systems are used for quality control and environmental care? In chapter five, paragraph 4, examples are given of these systems, as a part of the organizational processes. The INK/EFQM-model pays a lot of attention to the importance of processes in the company. The ISO 14000-series give a good view on environmental management systems.

How does C2C contribute to environmental management? This is partly described in chapter two, where C2C is compared with preventive environmental management systems. In chapter four is explained that C2C can contribute on a bigger scale, because it focuses on the whole company, or even the supply chain. This will bring the environmental management to a higher level, as is described in § 4.6.

C2C and financial performance

What are the theories on the linkage of financial and environmental performance? In chapter five the ways in which environmental management influence the financial performance is analyzed. There is a positive relation between environmental performance and financial performance, in both directions. The positive relation between environmental management and financial performance can be obtained by an increase of market gains and by cost-savings. Investments in environmental measures are dependent on the firm’s financial performance. This is also expected for C2C. The interviews don’t give a clear image of the influence of financial performance on the investments in C2C. Most respondents gave a neutral score.

How is financial performance influenced by C2C? There is not very much data on the financial consequences of C2C. However, prior research shows that there is a positive relation between environmental performance and financial performance of the company, and that C2C can be compared with certain aspects of existing environmental care systems. A positive relation between C2C and financial performance is therefore also expected. The cost-savings as result of efficient use of materials, energy and water and the increased benefits as result of the increased image of the firm are expected to be the main reasons for a positive influence of C2C on the firm’s financial performance. The interviews confirm that there is a positive relation between C2C and financial performance. The respondents expect that the benefits of C2C will be higher than the costs. Cost-savings are found in efficiency-gains as a result of efficient use of materials, energy and waste. The adoption of C2C is expected to be of great influence on the image of the firm. Several respondents stated that C2C also influences the financial performance because of the expansion of collaborations within the chain.

8.2.2 – Conclusions upon the organizational characteristics

In chapter 6 the conclusions of the literature study were combined in figure 6.2 and table 6.1. It showed that there were two types of firms in which C2C would fit the best. The first type had a prospector strategy, an organic organizational structure, flexible and innovative processes and an aim on financial performance through increased image. In figure 8.1 this type of firm is represented.

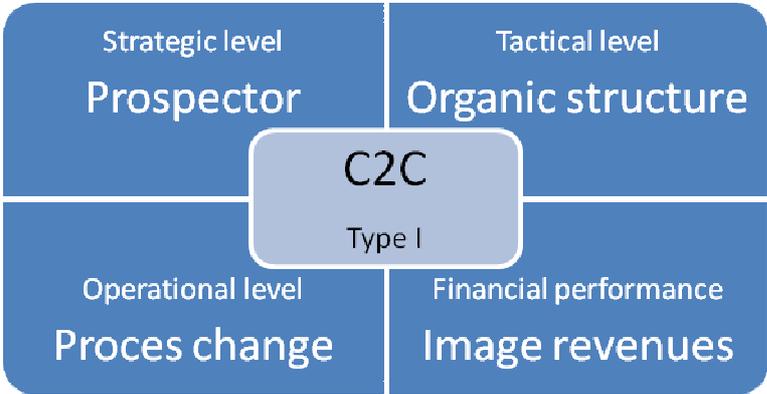


Figure 8.1 – Combined conclusions type I

The characteristics of these types of firms are innovativeness, decentralization, flexibility and revenues through increased image. Many of the companies that participated in the interviews fit in these characteristics.

The other type of organizations that are suited for C2C adoption had a defender strategy, a machine bureaucracy configuration, a focus on process control and cost-savings. In figure 8.2 these companies are represented.

Companies of the second type are risk-avoiding, have a stable environment and focus on control and efficiency. The interviewed companies had fewer similarities with these types of companies, although the focus on cost-savings was mentioned as a major benefit from C2C.

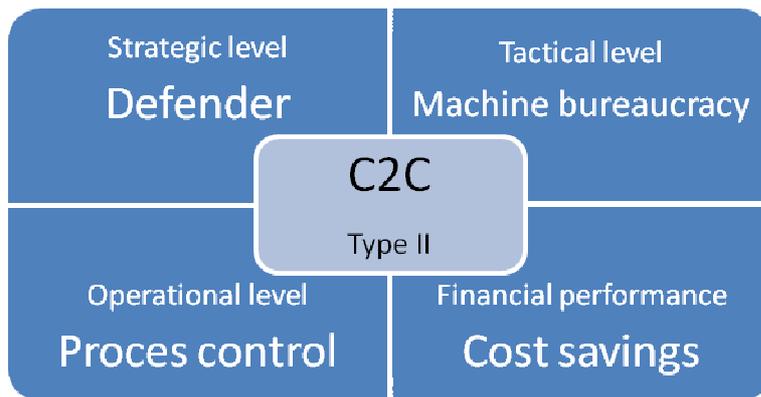


Figure 8.2 – Combined conclusions type II

When taking a closer look at the characteristics of these two types, the companies of type I have similarities with early adopters, while the companies from type II are followers. They might be willing to adopt C2C, but only when it has proved to be beneficial and when the risks are minimized. Because of the early stage of development of C2C, companies of the first type will be more suited to adopt C2C in an effective and profitable way. Also because of the required flexibility and innovativeness the companies from the first type are expected to adopt C2C sooner and benefit more.

8.2.3 – Final conclusion upon the research question

Finally, the main research question of this thesis needs to be answered. So, “**How does C2C contribute to the firm’s for-profit goals?**” Literature study and interviews showed that C2C can contribute to the firm’s financial performance via increased revenues because of an increased image of the firm and via cost-savings because of the more effective use of materials, recycling, energy and water, and because of the lower costs for waste treatment.

In both cases it is necessary that the firm knows how to use these possibilities. The firm needs to know how to make use of their increased image. This requires a strong marketing department and a flexible organization. Cost-savings can be obtained when the firm has an innovative culture and the technological abilities to redesign their production process. Therefore, a strong R&D department and technocratic and supporting staff are needed. In order to receive cost-savings through recycling, a strong collaboration within the chain is necessary.

Taking these conditions into account, especially the early adopters with a prospector strategy, an organic structure and a focus on process-change will benefit.

8.3 Discussion

To finish this thesis, the methods and results of this thesis are discussed, to get a clear view of the shortcomings of this thesis and possible new areas for further research.

Early stage of C2C adoption in the Netherlands

This thesis focused on the consequences of C2C. However, C2C is still a quite new concept, which is not yet implemented in many companies. Also the companies that have implemented (elements of) C2C are often in a very early stage of the development of their C2C-activities. Therefore, there was almost none information about the financial and social consequences. Several respondents stated that this research was done in a too early stage of C2C. It would therefore be interesting to check the financial consequences of C2C in a later stage, when C2C is adopted by more companies, and especially in companies with several years of experience. This research is explorative, because of the limited data, but further investigation could be done using a quantitative methodology.

More focus on the chain

The focus in the literature study was merely on the individual organization, with a focus on the managerial levels within the company and the organizational structure. However, the interviews showed that C2C is primarily focused on the chain, and will only work when implemented in and supported by all members of the supply chain. Therefore, further investigation on the chain is necessary, for example on the following questions: Is C2C also profitable because of the improved collaboration in the chain? Does C2C align companies in the chain? Does C2C offer benefits because of better cooperation in the chain, both horizontal and vertical? These kind of questions can provide more information about the opportunities of C2C as a tool to connect environmentally-concerned companies.

Explorative research leads to more questions

This research contained a literature study and interviews. Both were quite broad, so a lot of topics are mentioned, but not all subjects got analyzed in more detail. The research was explorative, so it was not possible to make reliable analyses of the interview results. The interviews resulted in interesting quotes from the participating companies, but because the sample was not very large (N=15) and the backgrounds of the companies was very diverse, the results were hard to analyze with statistical tests. Even non-parametric methods like the Mann-Whitney U-test and the Kruskal-Wallis test, and Partial Least Square methods like SPLS, which are often used for small samples, gave almost no significant results. When further research is done, a bigger sample is needed to get reliable results.

Several topics that were mentioned in this thesis, were not taken into further investigation, due to a lack of available information or because it did not fit in the context of this thesis. A more extensive study on the financial consequences of C2C in a later stage was already mentioned. In the interviews the participating companies came from so many different sectors that it was not possible to make a distinction of the results for certain sectors. If the adoption of C2C is more widely spread, it would also be interesting to see if there are certain sectors for which C2C is more suitable or more profitable. Also the adoption of C2C in the service-sector would be interesting to investigate further.

C2C is moving from its status as a relatively unknown new tool to solve environmental problems to a hype in companies that focus on sustainable business. As a result, also companies that want to have a green image promote themselves as C2C companies, while the activities of these companies not always meet the C2C principles. In these cases the question rises if the goal is to work with C2C, or to increase the firm's image. This was mentioned by several of the respondents in this research. It might be interesting to analyze how C2C can prevent this, but also if the official C2C certification-process is easy accessible for all kinds of companies.

The interviews showed that companies expected that the image of their firm would increase because of their C2C activities. It might be interesting to do further research to the effects on turnover, to see if this image indeed does influence this. This relates to the opinion of the stakeholders regarding C2C. Are the customers familiar with C2C, do they want to pay for it, are shareholders convinced of the financial possibilities of C2C, does government support it, are other chain-members willing to cooperate, and so on.

This research thus was explorative and gives a starting point for further research in many different topics related to C2C.

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Appendix 1 - Interview protocol

Interview cradle-to-cradle

Dit interview is onderdeel van een onderzoek naar de financiële gevolgen van het cradle-to-cradle concept dat ik momenteel uitvoer voor mijn afstuderen aan de leerstoelgroep managementstudies van de universiteit van Wageningen. Dit interview bestaat uit 15 vragen die grotendeels in de vorm van stellingen zijn vormgegeven.

Na een paar algemene vragen wordt er ingegaan op de manier waarop uw bedrijf op dit moment omgaat met een aantal milieuzaken, gevolgd door een paar vragen over de structuur van uw organisatie. Hierna volgen enkele vragen over de financiële consequenties van de milieumaatregelen die uw bedrijf gebruikt. Voor al deze vragen maakt het niet uit of u al dan niet bekend bent met het cradle-to-cradle begrip. Na een korte uitleg van cradle-to-cradle volgen hier nog enkele vragen over, waarna u nog eventuele extra opmerkingen kunt plaatsen.

Algemene vragen

Datum: ____ - ____ - 2009

Bedrijf:

Telefoon:

Respondent:

Functie en jaren ervaring:

In welke sector is uw bedrijf actief?

BIK code: _____

Aantal FTE: _____

Omzet in euro: _____

Vragen milieu

1. Reageer op de volgende stellingen over de manier waarop uw bedrijf omgaat met de materialen die gebruikt worden: (1: niet van toepassing, 7: sterk van toepassing)

Wij minimaliseren het gebruik van schadelijke stoffen	1 - 2 - 3 - 4 - 5 - 6 - 7
Wij zoeken alternatieven voor schadelijke stoffen	1 - 2 - 3 - 4 - 5 - 6 - 7
Onze producten worden zo (her)ontworpen dat er zo min mogelijk schadelijke stoffen in zitten	1 - 2 - 3 - 4 - 5 - 6 - 7
Er worden zo veel mogelijk duurzame producten gebruikt	1 - 2 - 3 - 4 - 5 - 6 - 7
Er is een strategie ontwikkeld om verantwoord om te gaan met de schadelijke stoffen die nog gebruikt worden	1 - 2 - 3 - 4 - 5 - 6 - 7

2. Reageer op de volgende stellingen m.b.t. de mate waarin uw bedrijf zich richt op recycling van grondstoffen en uw producten: (1: niet van toepassing, 7: sterk van toepassing)

Onze producten zijn afbreekbaar/composteerbaar	1 - 2 - 3 - 4 - 5 - 6 - 7
Onze producten zijn eenvoudig te ontmantelen	1 - 2 - 3 - 4 - 5 - 6 - 7
Onze producten zijn zo ontworpen dat ze eenvoudig te recyclen zijn	1 - 2 - 3 - 4 - 5 - 6 - 7
We beschikken over logistieke processen om onze producten na gebruik terug te halen voor recycling	1 - 2 - 3 - 4 - 5 - 6 - 7
We hebben een afdeling voor recycling	1 - 2 - 3 - 4 - 5 - 6 - 7
We promoten teruggave voor recycling van ons product	1 - 2 - 3 - 4 - 5 - 6 - 7

3. Reageer op de volgende stellingen met betrekking tot het water- en energiegebruik binnen uw organisatie: (1: niet van toepassing, 7: sterk van toepassing)

Er is een strategie ontwikkeld voor efficiënt energiegebruik	1 - 2 - 3 - 4 - 5 - 6 - 7
Er wordt zonne-energie gebruikt voor het productieproces	1 - 2 - 3 - 4 - 5 - 6 - 7
Er wordt zonne-energie gebruikt voor het hele bedrijf	1 - 2 - 3 - 4 - 5 - 6 - 7
Het energieverbruik voor recycling wordt bij het ontwerp in gedachten gehouden	1 - 2 - 3 - 4 - 5 - 6 - 7
Er is een strategie ontwikkeld voor efficiënt watergebruik	1 - 2 - 3 - 4 - 5 - 6 - 7
Water dat het bedrijf verlaat is schoner dan toen het binnenkwam	1 - 2 - 3 - 4 - 5 - 6 - 7
Bij het productieproces wordt spaarzaam met water omgegaan	1 - 2 - 3 - 4 - 5 - 6 - 7

Vragen organisatie

4. Reageer op de volgende stellingen met betrekking tot uw organisatie: (1: niet van toepassing, 7: sterk van toepassing)

Er is beleid voor Maatschappelijk Verantwoord Ondernemen aanwezig in ons bedrijf (MVO / CSR beleid)	1 – 2 – 3 – 4 – 5 – 6 – 7
Onze werknemers zijn op de hoogte van de morele standaarden van ons bedrijf	1 – 2 – 3 – 4 – 5 – 6 – 7
Planners, controllers, werkvoorbereiders spelen een belangrijke rol in onze organisatie	1 – 2 – 3 – 4 – 5 – 6 – 7
Onze ondersteunende staf (R&D, PR, salarisadministratie) speelt een belangrijke rol in ons bedrijf (vergeleken met werkvloer / management)	1 – 2 – 3 – 4 – 5 – 6 – 7
We bevinden ons in een dynamische markt	1 – 2 – 3 – 4 – 5 – 6 – 7
We zijn een innovatief bedrijf in onze sector	1 – 2 – 3 – 4 – 5 – 6 – 7
Werkzaamheden worden bij ons verdeeld door onderlinge afstemming	1 – 2 – 3 – 4 – 5 – 6 – 7
Ons bedrijf kenmerkt zich door een sterke mate van decentralisatie	1 – 2 – 3 – 4 – 5 – 6 – 7

Vragen financieel

In het volgende gedeelte worden enkele vragen gesteld over de financiële consequenties van uw huidige milieumaatregelen. Eerst wordt ingegaan op de kosten, vervolgens op de opbrengsten.

5. Reageer op de volgende stellingen m.b.t. uw huidige milieuzorgsysteem: (1: oneens, 7: eens)

Onze milieumaatregelen zorgen voor hoge administratieve lasten	1 – 2 – 3 – 4 – 5 – 6 – 7
Personeelskosten (bijscholing en extra uren) zijn een belangrijke kostenpost voor ons huidige milieuzorgsysteem	1 – 2 – 3 – 4 – 5 – 6 – 7
Er waren hoge investeringskosten nodig voor ons milieuzorgsysteem	1 – 2 – 3 – 4 – 5 – 6 – 7
De kosten voor onze milieuzorg zijn hoger dan de baten	1 – 2 – 3 – 4 – 5 – 6 – 7
Wij investeren veel in R&D voor onderzoek naar verbeteringen in onze milieuzorg	1 – 2 – 3 – 4 – 5 – 6 – 7

6. In hoeverre zijn de milieumaatregelen die uw bedrijf heeft genomen van invloed op de financiële prestaties van uw bedrijf? (1: weinig invloed, 7: veel invloed)

Prijs van product	n.v.t.	1 – 2 – 3 – 4 – 5 – 6 – 7
Omzet	n.v.t.	1 – 2 – 3 – 4 – 5 – 6 – 7
Kostenbesparing op materialen en energieverbruik	n.v.t.	1 – 2 – 3 – 4 – 5 – 6 – 7
Kostenbesparing op afvalverwerking en heffingen	n.v.t.	1 – 2 – 3 – 4 – 5 – 6 – 7
Productiviteit	n.v.t.	1 – 2 – 3 – 4 – 5 – 6 – 7
Subsidies	n.v.t.	1 – 2 – 3 – 4 – 5 – 6 – 7
Imago	n.v.t.	1 – 2 – 3 – 4 – 5 – 6 – 7

7. In hoeverre zijn de investeringen in milieumaatregelen afhankelijk van de financiële performance van uw bedrijf? (1: totaal niet, 7: volledig)

1 – 2 – 3 – 4 – 5 – 6 – 7

Vragen Cradle-to-Cradle

Cradle-to-cradle, afgekort als C2C, is een relatief nieuw idee over hoe milieuproblematiek aangepakt kan worden. De belangrijkste gedachte in de cradle-to-cradle filosofie is dat alle materialen uit een product kunnen worden hergebruikt in andere producten. Er wordt uitgegaan van een eindeloze kringloop, ofwel biologisch, ofwel technologisch. Hierdoor kunnen alle stoffen worden gerecycled, zonder kwaliteitsverlies. Om dit te bereiken moet men streven naar eco-effectiviteit; het ontwerpen op zo'n manier dat producten gezond en veilig zijn, en een positief effect hebben op economisch, ecologisch en sociaal gebied. Producten die aan de cradle-to-cradle standaarden voldoen bevatten geen schadelijke stoffen, zijn recyclebaar, worden geproduceerd met aandacht voor het water- en energieverbruik tijdens het productieproces.

8. Bent u bekend met het C2C concept? Ja → ga door met vraag 9
 Nee → ga door naar vraag 12

9. Werkt u met C2C, zo ja op welke manier, zo nee waarom niet?

10. Wat zijn uw ervaringen met de winstgevendheid van C2C? Heeft u concrete voorbeelden van de invloed van C2C op de financiële prestaties van uw bedrijf?

11. Hoe zou u de invloed van C2C op de financiële prestaties van bedrijven vergelijken met de invloed van bestaande milieuzorgsystemen?

12. Reageer op de volgende stellingen over de kans van slagen als een bedrijf C2C implementeert. (Wanneer u niet bekend met het begrip cradle-to-cradle (C2C) dan kunt u bij het beantwoorden van de volgende vragen uitgaan van wat u in het kader voor vraag 8 hebt gelezen.) (1: *helemaal niet mee eens*, 7: *helemaal mee eens*)

C2C werkt alleen als het geïntegreerd wordt in het hele bedrijf	1 – 2 – 3 – 4 – 5 – 6 – 7
C2C werkt alleen in innovatieve bedrijven	1 – 2 – 3 – 4 – 5 – 6 – 7
C2C past niet in bedrijven met weinig investeringen in R&D	1 – 2 – 3 – 4 – 5 – 6 – 7
C2C moet gedragen worden door alle managementniveaus	1 – 2 – 3 – 4 – 5 – 6 – 7
C2C werkt het best in bedrijven waar werknemers veel inspraak hebben in het productieproces	1 – 2 – 3 – 4 – 5 – 6 – 7

Dit interview is onderdeel van een onderzoek naar de financiële gevolgen van cradle-to-cradle maatregelen. Hiertoe worden nu enkele vragen gesteld, waarbij eerst wordt ingegaan op de kosten en daarna op de baten.

13. Reageer op de volgende stellingen met betrekking tot de lasten als gevolg van het invoeren van het cradle-to-cradle concept: (1: *helemaal mee oneens*, 7: *helemaal mee eens*)

Invoering van C2C zorgt voor hoge extra administratieve lasten	1 – 2 – 3 – 4 – 5 – 6 – 7
De extra personeelskosten (bijscholing en extra uren) door C2C zijn hoog	1 – 2 – 3 – 4 – 5 – 6 – 7
Hoge investeringskosten zijn noodzakelijk bij C2C	1 – 2 – 3 – 4 – 5 – 6 – 7
De kosten van C2C zijn hoger dan de opbrengsten	1 – 2 – 3 – 4 – 5 – 6 – 7

14. In hoeverre zijn cradle-to-cradle maatregelen van invloed op de positieve financiële prestaties? (1: *weinig invloed*, 7: *veel invloed*)

Prijs van product	n.v.t.	1 – 2 – 3 – 4 – 5 – 6 – 7
Omzetstijging	n.v.t.	1 – 2 – 3 – 4 – 5 – 6 – 7
Kostenbesparing op materialen en energieverbruik	n.v.t.	1 – 2 – 3 – 4 – 5 – 6 – 7
Kostenbesparing op afvalverwerking en heffingen	n.v.t.	1 – 2 – 3 – 4 – 5 – 6 – 7
Productiviteit	n.v.t.	1 – 2 – 3 – 4 – 5 – 6 – 7
Subsidies	n.v.t.	1 – 2 – 3 – 4 – 5 – 6 – 7
Imago	n.v.t.	1 – 2 – 3 – 4 – 5 – 6 – 7

15. Als u werkt met cradle-to-cradle, of zou overwegen er mee te gaan werken, in hoeverre zijn de investeringen in C2C milieumaatregelen dan afhankelijk van de financiële performance van uw bedrijf? (1: *totaal niet*, 7: *volledig*)

1 – 2 – 3 – 4 – 5 – 6 – 7

Einde van het interview. Eventuele verdere opmerkingen kunnen hieronder worden gegeven.

Hartelijk dank voor uw medewerking!

Appendix 2 – Correlation matrix

The correlations between the clusters of questions as they are used in chapter 8 are given on this and the next page.

Correlations clusters interview-questions		Score_C2C	MaterialsTotal	RecyclingTotal	EnergyTotal	WaterTotal	CSRTotal	C2C_total	Machine bureaucracy	Adhocracy
Score_C2C	Pearson Corr.	1								
	Sig. (1-tailed)									
	N	15								
MaterialsTotal	Pearson Corr.	.552(*)	1							
	Sig. (1-tailed)	0.016								
	N	15	15							
RecyclingTotal	Pearson Corr.	.664(**)	0.326	1						
	Sig. (1-tailed)	0.003	0.118							
	N	15	15	15						
EnergyTotal	Pearson Corr.	0.356	-0.256	0.347	1					
	Sig. (1-tailed)	0.096	0.179	0.102						
	N	15	15	15	15					
WaterTotal	Pearson Corr.	0.138	-0.141	-0.149	0.089	1				
	Sig. (1-tailed)	0.312	0.308	0.298	0.377					
	N	15	15	15	15	15				
CSRTotal	Pearson Corr.	.487(*)	0.025	.593(**)	0.374	0.057	1			
	Sig. (1-tailed)	0.033	0.465	0.010	0.085	0.421				
	N	15	15	15	15	15	15			
C2C_total	Pearson Corr.	.869(**)	.622(**)	.798(**)	0.428	0.100	.499(*)	1		
	Sig. (1-tailed)	0.000	0.007	0.000	0.056	0.361	0.029			
	N	15	15	15	15	15	15	15		
Machine bureaucracy	Pearson Corr.	.500(*)	0.317	.445(*)	0.024	-0.128	.583(*)	.538(*)	1	
	Sig. (1-tailed)	0.029	0.125	0.048	0.466	0.325	0.011	0.019		
	N	15	15	15	15	15	15	15	15	
Adhocracy	Pearson Corr.	0.364	0.038	.441(*)	0.002	0.031	.703(**)	0.376	.893(**)	1
	Sig. (1-tailed)	0.091	0.447	0.050	0.497	0.456	0.002	0.084	0.000	
	N	15	15	15	15	15	15	15	15	15
Costsavings	Pearson Corr.	0.432	.680(**)	0.212	-0.284	0.043	0.232	.472(*)	0.393	0.209
	Sig. (1-tailed)	0.054	0.003	0.224	0.152	0.440	0.203	0.038	0.074	0.227
	N	15	15	15	15	15	15	15	15	15
Costs	Pearson Corr.	0.084	0.153	-0.180	-0.003	.482(*)	-0.310	0.123	-0.141	-0.139
	Sig. (1-tailed)	0.383	0.294	0.260	0.496	0.034	0.130	0.331	0.308	0.311
	N	15	15	15	15	15	15	15	15	15
Benefits	Pearson Corr.	0.265	.556(*)	0.160	-0.285	-0.065	0.382	0.329	0.359	0.243
	Sig. (1-tailed)	0.170	0.016	0.284	0.152	0.408	0.080	0.116	0.095	0.192
	N	15	15	15	15	15	15	15	15	15
BenefitsC2C	Pearson Corr.	0.226	0.319	0.283	-0.264	-0.144	.514(*)	0.269	0.454	0.400
	Sig. (1-tailed)	0.218	0.133	0.163	0.181	0.312	0.030	0.177	0.051	0.078
	N	14	14	14	14	14	14	14	14	14
BenefitsEMS	Pearson Corr.	0.370	.733(**)	0.181	-0.102	0.050	0.100	.463(*)	0.060	-0.131
	Sig. (1-tailed)	0.087	0.001	0.259	0.359	0.430	0.361	0.041	0.415	0.321
	N	15	15	15	15	15	15	15	15	15
CostsEMS	Pearson Corr.	0.054	-0.021	-0.180	0.129	.608(**)	-0.253	0.136	-0.064	-0.060
	Sig. (1-tailed)	0.424	0.470	0.260	0.323	0.008	0.182	0.314	0.411	0.415
	N	15	15	15	15	15	15	15	15	15
CostsC2C	Pearson Corr.	0.200	0.218	0.062	0.000	0.203	-0.244	0.165	-0.266	-0.255
	Sig. (1-tailed)	0.247	0.227	0.417	0.499	0.244	0.200	0.287	0.179	0.189
	N	14	14	14	14	14	14	14	14	14
Strategy	Pearson Corr.	.740(**)	.486(*)	.687(**)	0.263	.462(*)	.459(*)	.827(**)	0.344	0.316
	Sig. (1-tailed)	0.001	0.033	0.002	0.172	0.041	0.043	0.000	0.105	0.126
	N	15	15	15	15	15	15	15	15	15
Organisation	Pearson Corr.	.712(**)	.620(**)	.466(*)	0.352	0.046	0.160	.844(**)	.476(*)	0.199
	Sig. (1-tailed)	0.001	0.007	0.040	0.099	0.436	0.284	0.000	0.036	0.238
	N	15	15	15	15	15	15	15	15	15
Processes	Pearson Corr.	.814(**)	.511(*)	.874(**)	0.440	0.033	.658(**)	.926(**)	.513(*)	0.438
	Sig. (1-tailed)	0.000	0.026	0.000	0.050	0.453	0.004	0.000	0.025	0.051
	N	15	15	15	15	15	15	15	15	15

*. Correlation is significant at the 0.05 level (1-tailed).

** Correlation is significant at the 0.01 level (1-tailed).

Correlations clusters interview-questions		Costsavings	Costs	Benefits	BenefitsC2C	BenefitsEMS	CostsEMS	CostsC2C	Strategy	Organisation	Processes
Score_C2C	Pearson Corr. Sig. (1-tailed) N										
Materials Total	Pearson Corr. Sig. (1-tailed) N										
RecyclingTotal	Pearson Corr. Sig. (1-tailed) N										
EnergyTotal	Pearson Corr. Sig. (1-tailed) N										
WaterTotal	Pearson Corr. Sig. (1-tailed) N										
CSRTotal	Pearson Corr. Sig. (1-tailed) N										
C2C_total	Pearson Corr. Sig. (1-tailed) N										
Machine bureaucracy	Pearson Corr. Sig. (1-tailed) N										
Adhocracy	Pearson Corr. Sig. (1-tailed) N										
Costsavings	Pearson Corr. Sig. (1-tailed) N	1									
Costs	Pearson Corr. Sig. (1-tailed) N	-0.156 0.289 15	1								
Benefits	Pearson Corr. Sig. (1-tailed) N	.745(**) 0.001 15	0.081 0.387 15	1							
BenefitsC2C	Pearson Corr. Sig. (1-tailed) N	.705(**) 0.002 14	-0.180 0.269 14	.928(**) 0.000 14	1						
BenefitsEMS	Pearson Corr. Sig. (1-tailed) N	.592(*) 0.010 15	0.317 0.125 15	.779(**) 0.000 14	.464(*) 0.047 15	1					
CostsEMS	Pearson Corr. Sig. (1-tailed) N	-0.086 0.380 15	.845(**) 0.000 15	-0.022 0.469 15	-0.210 0.235 14	0.153 0.293 15	1				
CostsC2C	Pearson Corr. Sig. (1-tailed) N	-0.216 0.229 14	.844(**) 0.000 14	0.055 0.426 14	-0.094 0.375 14	0.308 0.142 14	0.374 0.094 14	1			
Strategy	Pearson Corr. Sig. (1-tailed) N	0.378 0.083 15	0.247 0.188 15	0.237 0.198 15	0.139 0.317 14	0.401 0.069 15	0.276 0.160 15	0.217 0.228 14	1		
Organisation	Pearson Corr. Sig. (1-tailed) N	.575(*) 0.012 15	0.228 0.207 15	0.338 0.109 15	0.275 0.171 14	.451(*) 0.046 15	0.248 0.187 15	0.193 0.254 14	.553(*) 0.016 15	1	
Processes	Pearson Corr. Sig. (1-tailed) N	0.298 0.140 15	-0.004 0.494 15	0.272 0.163 15	0.231 0.214 14	0.380 0.081 15	0.007 0.491 15	0.079 0.395 14	.787(**) 0.000 15	.600(**) 0.009 15	1

*. Correlation is significant at the 0.05 level (1-tailed).

** . Correlation is significant at the 0.01 level (1-tailed).

Appendix 3 – Clusters and Cronbach alpha's

The following clusters are used in the interview-analysis.

Cluster	Questions	Cronbach's alpha	Mean	Stdev
Materials	1a, 1b, 1c, 1d, 1e	.724	6.02	1.35
Recycle	2a, 2b, 2c, 2d, 2e, 2f	.860	4.57	1.99
Energy	(3a), 3b, 3c, 3d	.489/ .651	5.53	2.05
Water	3e, (3f), 3g	.680 / .938	5.13	2.07
CSR	4a, 4b	.779	5.93	0.85
C2C	1, 2, 3, 4a-b	.824	5.04	1.03
Strategy	1e, 2f, 3a, 3e, (4a)	.237 / .879	5.67 / 5.58	0.94
Organization	1a, 1b, 2e, 3b, 3c, 3f, 4b	.687	4.28	1.67
Processes	1c, 1d, 2a-d, 3d, 3g, 4b	.775	5.02	0.80
Organic structure	4d, 4e, 4f, 4g, 5e	0.793	5.52	0.91
Machine bureaucracy	4c, 4e, 4f, 4g, 4h, 5e	0.728	5.52	0.84
Costs EMS	5a, 5b, 5c	.653	3.60	0.88
Benefits EMS	6a, (6b)-6g	.610 / .746	4.61 / 4.71	0.98 / 1.55
Costs C2C	13a, 13b, 13c	.707	3.60	0.53
Benefits C2C	14a-14g	.708	4.94	0.74
Total costs	5a-5c, 13a-13c	.706	3.68	1.12
Total benefits	6a-6g, 14a-14g	.808	4.84	0.53
Cost-savings	6c, 6d, 14c, 14d	.815	4.69	1.37
Image	6g, 14g	.141	-	-
Productivity	6e, 14e	.648	4.20	1.81
Defenders	4c, 6c-6f, 14c-14f	.910	4.64	1.31
Prospectors	4e-4h, 6g, 14g	.770	5.88	0.87
Innovators	4f	-	6.20	0.77

Appendix 4 – Non-parametric statistical tests

While analyzing the interview results, many different statistical tests were performed, using SPSS for Windows and Smart-PLS. Most of these tests gave no significant results, so they could not be used in the analysis in chapter 8. In some parts of the analysis, where a significant relation would have been very helpful, is mentioned that the related test gave no significant results. In this appendix the results of these tests are given, to get an impression of the tests that were performed.

In § 8.5 and 8.6.3 the use of Mann-Whitney U-tests was mentioned for the comparison of the score on C2C with the organizational configuration (§ 8.5) and the expected costs and benefits (§ 8.6.3). In the following tables the results are presented.

Score C2C	N	Mean Rank	Sum of Ranks
Machine bureaucracy	8	6.13	49.00
Average High	7	10.14	71.00
Total	15		
Organic structure	8	6.69	53.50
Average High	7	9.50	66.50
Total	15		
Costs C2C are higher than benefits	7	8.50	59.50
Average High	7	6.50	45.50
Total	14		

Test Statistics(b)	Machine bureaucracy	Organic structure	Costs C2C higher than benefits
Mann-Whitney U	13.000	17.500	17.500
Wilcoxon W	49.000	53.500	45.500
Z	-1.742	-1.221	-.938
Asymp. Sig. (2-tailed)	.081	.222	.348
Exact Sig. [2*(1-tailed Sig.)]	.094(a)	.232(a)	.383(a)

a Not corrected for ties.

b Grouping Variable: Score_C2C

In § 8.6.4 the size of the company was compared with the score on the dependency of C2C investments on financial performance. Because there are more than two groups, a Kruskal-Wallis test was performed.

Size of the company	N	Mean Rank
Is C2C depended on your financial performance	4	6.88
Small	6	6.08
Medium	5	11.20
Large	15	
Total		

Test Statistics ^{a,b}

	Is C2C depended on your financial performance
Chi-Square	4.038
df	2
Asymp. Sig.	.133

a. Kruskal Wallis Test

b. Grouping Variable: Size of the company