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How CSR and stakeholder engagement encourage the development of Industrial symbiosis from the management viewpoint?

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ABSTRACT

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The thesis aims to understand how CSR and stakeholder engagement can contribute to the development of industrial symbiosis. Theory suggests that corporate social responsibility and stakeholder engagement theories have many similar aspects that correlate with the development of industrial symbiosis. This study is qualitative and empirical suggestions are derived from integrative analysis of literature, secondary data and case study analysis. The empirical findings from the interviews support the framework that is created from the findings of the literature review. The results discovered throughout the thesis research suggest that CSR functions as a theoretical background for industrial symbiosis and stakeholder engagement helps develop more thorough understandings of it from the management viewpoint. Empirical findings and literature review also suggest that in the developing of industrial symbiosis the key aspect are the social characteristics such as a robust management structure, trust between partners and long-term commitment to the common goals that support the development of these symbioses. Also, communication and transparency supports the development of industrial symbiosis. For managerial contribution, this thesis presents organizational practices that can help managers to understand how they can engage in effective engagement with stakeholders in the development of industrial symbiosis.

The value of an idea lies in the using of it.

-Thomas Edison-

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1. INTRODUCTION

The goal of this chapter is to provide and introduction that presents an insight into the research section in question. It will start from the discussion of the background shedding light to the development of the study and after this the research gap is presented. This chapter will provide the main research questions and its sub-questions. In addition, the chapter presents delimitations of the research and level of analysis of the study as well as provides the outline of the thesis.

1.1 Background of the study

The environmental crisis has emphasized the connection between social, economic and environmental organizations. These three issues together form a basis for sustainability. The most famous definition is stated in the Brundtland's report "Our Common Future" and this classification derived from it is mentioned in various academic reports and researches. The argument follows the idea that sustainable development would make it possible "to meet the needs and aspirations of the present (society) without compromising the ability to meet those of the future" (Steurer, et al 2005 & Hopwood, et al., 2005).

It seems that in the academic world as well as in the business markets, sustainable development has made itself a new paradigm that holds the responsibility of demonstrating how it is possible to rebuild social and economic systems in a way that shows more holistic and balanced viewpoint within the co-evolution with the nature itself. (Aparisi, 2010) Corporate social responsibilities follow the guidelines of sustainability and it fulfills the same goals as sustainability between social, economic and environmental aspects. (Mushka, 2015 & Dobele, et al., 2014)

Sustainable development has not emerged into the academic field without the critic because of its still vague definition of how it can actually contribute to the development of society and business within the given framework. It is because of this reason why the connection between CSR and industrial symbioses are valued aspects to the sustainable

development as they together give a clear direction of how to implement these three aspects (environmental, social and economic). (Chertow, 2007)

But the fact remains, that it presents a real challenge when companies are trying to implement socially responsible strategies. There has neither existed literature of the process by which this implementation occurs. (Dobele, et al., 2014; Bhattacharya et al., 2009; Maon et al., 2009) But as industrial symbiosis will provide industries goals of how to improve resource efficiency, and it will be combined with CSR and stakeholder engagement viewpoint, this will aim to demonstrate how from the managerial viewpoint it is possible to implement socially and environmentally responsible strategies. (Corder, et al., 2014)

Industrial symbiosis has been studied intensively from the early 90's and its increasing its popularity among the academic research studies. The basic concept was introduced within the premises of industrial ecology in the 1950s, but the first systematic presentation was made later and it introduced the basic characteristics of this concept such as inputs and outputs of the companies that can be optimized and shared by the industrial symbiosis members in order to maximize economic and environmental benefits. The benefits and evolutionary trend of these symbioses have been discussed fairly extensively as an environmental agenda within the framework of a sustainable economy. (Beyene, 2005)

With this sustainability approach in our economy, industrial symbiosis sets a keen focus on the industrial metabolism as well production processes. Industrial symbiosis gives a novel way to understand what industrial development stands for and at the same time it puts importance on eco-efficiency in addition to closing the loop of industrial systems. (Corder, et al., 2014) Industrial symbiosis can be seen as a concept of how to overcome the long standing struggle between industrial development and environmental protection. (Aparisi, 2010)

Industrial symbioses have long been studied from the technological, social perspective or how they are created in different regions with own unique characters or there have been attempts to pinpoint with different results what leads to success of these clusters or eco-industrial parks. There have been a few proposes to study industrial symbioses from the corporate social responsibility viewpoint but still academic research presents a gap to present IS in this way.

The goal of this study is to present the connections between the study arenas of CSR and stakeholder engagement in the persuasion of sustainable development through industrial symbiosis.

1.2 Research questions and the research gap

As industrial symbioses present a vital case for sustainability and at the same time fulfills many definitions of corporate social responsibility (CSR) that has been studied in a greater extent, but still there have been no studies that have combined CSR and its stakeholder engagement with industrial symbioses that offer many similarities.

This offers an academic gap that could prove to be viable for the managers working in the sustainable clusters such as these, because they could result to offer information of how to successfully develop these symbioses resulting in more sustainable ways to carry out business.

Because of the lack of consensus in sustainability definition, many companies are left without a sturdy framework of how theoretically and practically it would be possible to take the most advantage in the pursuit of sustainable development. Sustainable development has long needed a firm set of frameworks, and it can be benefit from the view of industrial symbiosis. Of course this study is conducted from the industrial viewpoint, but there is no reason why smaller sustainable exchange networks could not benefit for this study as well. The research questions are as follows:

Research question1: How CSR and its stakeholder engagement encourage the development of Industrial symbiosis from the management viewpoint?

Sub question 1: How does stakeholder engagement correlate with CSR and Industrial Symbiosis?

Sub question 2: What are the incentives to enter into industrial symbiosis?

Sub question 3: What social characteristics influence the development of industrial symbiosis?

Sub question 4: How companies can benefit from stakeholder engagement as a strategical approach in the development of Industrial Symbioses?

Table 1 "Research questions"

	Research Question	Research Goal	Method and Data
RQ1	How CSR and its stakeholder engagement encourage the development of Industrial symbiosis from the management viewpoint?	To study the opportunities of stakeholder engagement in the development and management of industrial symbiosis. To develop a framework for it.	Academic literature; secondary data; interview results
SQ1	How does stakeholder engagement correlate with CSR and Industrial Symbiosis?	To study the importance of social relations in CSR and IS and how they correlate with each other. Demonstrate how stakeholder engagement can operate as a bridge between CSR and IS.	Academic literature; interview results
SQ2	What are the incentives to enter into industrial symbiosis?	To study why companies should pursue the participation in sustainable networks	Academic literature; secondary data; interview results
SQ3	What social characteristics influence the development of industrial symbiosis?	How does different social aspects such as trust, communication and effective management influence the development of IS?	Academic literature; secondary data; interview results

SQ4	How companies can benefit from stakeholder engagement as a strategical approach in the development of Industrial Symbioses?	To show the importance of stakeholder engagement and how companies can benefit from it. This aims to show the importance of social aspects of IS for the management and aid companies to find strategical approaches to the development of IS.	Academic literature; secondary data; interview results

Table 1 presents questions that functions as a starting point for the construction of the thesis. In the world where business operates in a quartely fashion and the long-term viewpoint has seem to diminish especially in the west, CSR and industrial symbiosis reminds of its existence. Industrial symbiosis offers a practical example of actions that considers economic benefits in the long-run without forgetting the agreements of sustainable development and environmental management. (Hopwood, et al., 2005) In the world of diminishing resources novel ways are needed to support the new mechanisms in our markets so that the long-term view of financial gains will demonstrate a new way to function in collobaration with cleaner production techinques and eco-efficiency opportunities. (Corder, et al., 2014)

1.3 Delimitations of the study

Two comprehensive parts of literature, CSR and industrial symbiosis, are presented together with stakeholder engagement for the literature review. Because this master's will aim to show how CSR functions as a theoretical basis for the development of industrial symbiosis, third sub- chapter will present stakeholder engagement that functions as a bridge between the concepts of CSR and industrial symbiosis. To take into consideration time limitation, the empirical part of this study is conducted with interviews with five

experts working on the arena of industrial symbiosis and using their knowledge of CSR and stakeholder engagement.

The thesis is narrowed to view the above stated research questions. This thesis is also, limited to show the correlation of industrial symbiosis and CSR and how stakeholder processes is affecting it. It also views the stakeholder engagement and industrial symbiosis from a managerial perspective, through the expertise of five specialists on the field.

1.4 Structure of the thesis

This research is made of six main chapters, its sub-chapters, references and appendixes. The first part sheds light to the background, the second one consist of the theory part and from the third one on, the empirical part will start with the creation of the theoretical framework. In the fourth chapter the research methodology will be presented and the fifth one will concentrate in the key research findings. After this in the final part the discussion and conclusion are being combined together in order to draw the final conclusions where the theoretical and empirical part will combine**.**

The two main parts are theoretical and empirical. This study aims to presents how the stakeholder engagement can contribute to the development of industrial symbiosis hence in the theoretical part there will be a presentation of CSR and industrial symbiosis. The final part of this theoretical review attempts to combine these concepts together through stakeholder engagement. These same concepts will be also under the study sphere of the empirical part.

The last part will show the theoretical and managerial contributions as well as summarize the whole research together.

2. LITERATURE REVIEW

This literature review studies how corporate social responsibility (CSR) and its stakeholder engagement can encourage the development of industrial symbiosis (IS) and its management. Therefore the concepts of CSR and IS will be first introduced individually. The idea is to show how stakeholder engagement functions as a bridge between these concepts. CSR is providing theoretical means for companies operate in a socially responsible way whereas industrial symbiosis offers tangible actions to implement these guidelines in real business life. Figure 1 offers a demonstration how the literature is conducted.

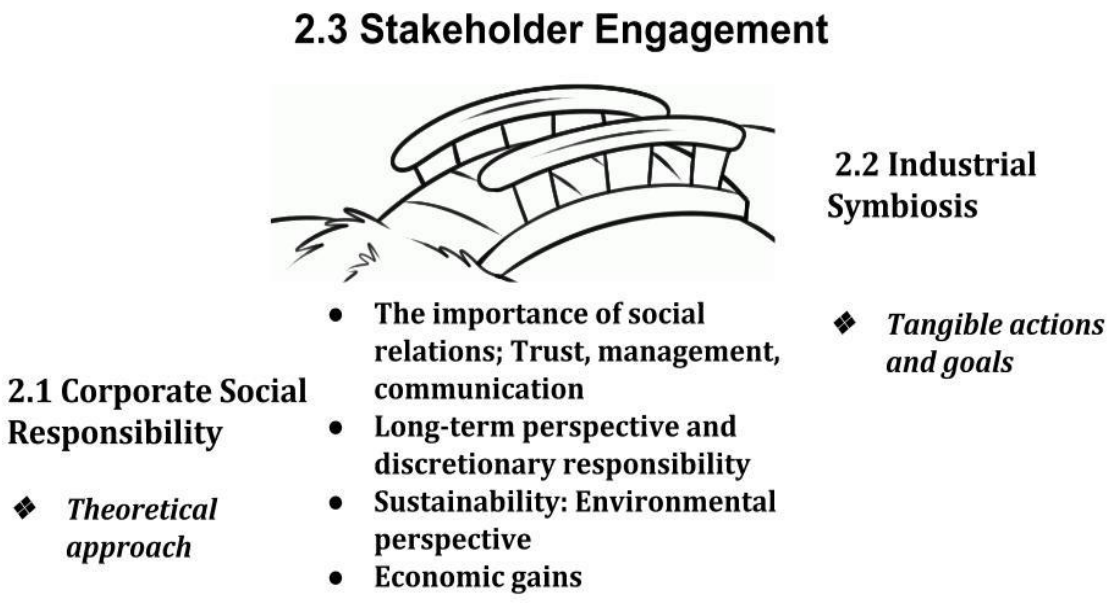


Figure 1 “From CSR to Industrial Symbiosis”

First part of the literature review presents corporate social responsibility and its definitions. The aim of this chapter is to present basis for the stakeholder engagement from the theoretical background. The second part will cover industrial symbiosis and its

development. Industrial symbiosis is a concrete way to accomplish the responsibilities presented in CSR theory.

The third part will concentrate on stakeholder engagement. Stakeholder engagement is considered to be the key to successfully implement CSR policies (Heismann, 2014; Maon, et. al., 2008) and in the development of industrial symbioses (Aparisi, 2010; Chertow, 2007; Beers, et al., 2007).

This part aims to show how stakeholder engagement can be used as a strategical tool for managers in the development of industrial symbioses. Hence the third part of the literature review will link these different concepts together – CSR and industrial symbioses – and bring strategical perspective for the managers how they can use stakeholder engagement when looking into new business opportunities.

Because companies have responsibility to bring financial benefits to shareholders but also balance between the interest of different stakeholder groups, companies need to demonstrate balanced business models. This means that companies develop programs that promote the environmental protection and/or social aspects while engaging different stakeholders in the process and communicating their intentions and goals to broader set of groups. The interest in the development of industrial symbioses via stakeholder engagement is to present a possibility how to pursuit socially and environmentally responsible programs while at the same time delivering profits to shareholders.

2.1 CORPORATE SOCIAL RESPONSIBILITY

This part will cover responsibilities related to CSR, definitions, the historical viewpoint and what is essential for companies when defining their CSR policies. This chapter also builds a foundation for the understanding of stakeholder engagement that is presented in the end.

There exists an intensive discussion between academics, experts and corporate management that aims to define a more social, more virtuous and a more transparent way

of conducting in business affairs. These different aims have resulted in the vast conversation about the concepts related to "sustainable development, corporate citizenship, sustainable entrepreneurship, Triple Bottom Line, business ethics, and corporate social responsibility." (Marrewijk, 2003, p 95-96)

However, no consensus has been given to the term CSR and it threatens to mean everything and yet nothing. In spite of its pervasive and long existence among the industry, academics or other parties involved, it yet remains without agreement of its definitions. (Sheehy, 2014, p.625; Dobele, et al., 2014; Steurer, et al., 2005) Table 1 presents responsibilities and the different functions connected to CSR.

Table 2 "Corporate social responsibility and its dimensions" (Moilanen & Haapanen, 2006)

Economic Responsibility	**Environmental Responsibility**		**Social responsibility**	
Financial and Business profitability	**Legal aspects**	**Resources and supply chain**	**Human rights**	**Stakeholders**

All of these concepts that are presented in the table 2 above are directly related to Corporate Social Responsibility and its main accountabilities. CSR has gained many different classifications but it is about doing business with more sustainable, humane and transparent way. (Sheehy, 2014; Steurer, et al., 2005; Marrewijk, 2003) In the conclusion, it can be said that CSR comes down to reducing companies' ecological impact as well as improving social consequences of their activities. (Porter & Kramer, 2006)

2.1.1 The development of Corporate Social Responsibility

History sheds light to the definition of corporate social responsibility that covers a vast scope of different aspects concerning our society and its functions. To look back and see how CSR has been developed there exists a first large scale consumer boycott that occurred in England in 1790s over slave harvested sugar. (Werther & Chandler, 2006)

To continue from that certain event that shaped it to be a historical episode in the eyes of the CSR because after the boycott, within few years it followed that more than 300,000 Britons were boycotting sugar, the major product of British West Indian slave plantations. (Werther & Chandler, 2006)

Another historical example is the case of the company Malden Mills, textile factory. The CEO of Malden Mills Aaron Feuerstein, made a decision to keep the textile plant in the area where fire had broken out earlier. Hence the CEO did not move the plant to a new country with insurance money where exists cheap labor force, but along with this decision and many others that reflect the excellent goodwill of the manager, Aaron Feuerstein also made another decision considering the wage checks of the employees. The CEO kept both white collar and blue collar employees and paid them during reconstruction of the plant. This increased the company's brand image and also increased sales but the debt was too much so eventually Malden Mills filed for bankruptcy protection in November 2001. (Werther & Chandler, 2006)

"This proves that unless the firm is economically viable, even the best intentions will not enable stakeholders to achieve their goals and maximize social values" (Werther & Chandler, 2006)

Hence it might not be in the heart of the company to only go after financial gains, but economic benefits must be guaranteed for the company to operate in the market and provide a holistic approach to the CSR itself. (Steurer, et al., 2005) Whether the question is about defining the concept of CSR or not, the fact remains that many companies are ranked based on their corporate social responsibility and no matter how invalid some of these ranking methods might prove out to be, they draw a considerable amount of attention towards the companies in question. (Porter & Kramer, 2006, p.1)

2.1.2 CSR definitions

Archie Carol (1991) a business manager has identified companies' four responsibilities derived from CSR and these aspects are shaped as pyramid where they reflect the commitment to company's stakeholders and build the overall picture of CSR itself. The four perspectives of CSR are as follows according to the article by (Anaejionu & Media, 2011):

1) **Economic Responsibility**: Every company holds a responsibility to operate under an economic framework and to produce acceptable Return on Investment (ROI).

2) **Legal responsibility**: Legal responsibility is a feature reflected from the norms of the society and those standards have the power to magistrate what can be considered as a respectable behavior from the organization itself and every company should act and operate in the respect towards those norms. Legal responsibility mentions that an organization must be able to act and follow the rules and regulation within the legal framework and federal policy and hence produce a set of actions that can be replicated also across the borders.

3) **Ethical Responsibility**: Thirdly a firm has an ethical responsibility to do no harm to its stakeholders and within its operating system and aim to produce the best result considering the group of stakeholders that the company's actions have an impact on.

4) **Discretionary responsibility**: The final part represents more proactive, strategic behaviors that can benefit the firm and society both.

Corporate social responsibility is both means and an end, an integral element of the firm's strategy that can be implemented in the core actions of the company and hence this way it can be reflected from every step of the way producing a result where all of these four aspect are in a balance with each other. (Mushka, 2015) But it is always good to take the

notion of matters, that even though company does not only exist because of the financial benefits they are in the very core of its motivations so that it will enable them to function, also in the future. (Werther & Chandler, 2006)

2.1.3 Four components essential to defining CSR policy

Companies' CSR is built inside their operations or then they can be seen separate from the actual business operations and more as a charity functions. (Jones, et al., 2009, p.305). There cannot exist any companies that would neglect CSR policies since many of these actions are legally binding that the government has set for them, but of course companies located in the developing countries have more motivation to go under the values of CSR. (Werther & Chandler, 2006; Jones et. al., 2009, p. 304)

According to Werther & Chandler (2006), there are four different components that are critical in order to define CSR policy in a company

1. CSR perspective
2. Core operations
3. Stakeholder Perspective
4. Over the medium to long term

The first perspective is taking into consideration the company's ability to follow the strategic guidelines. Core operations hold the activities that are important for the company itself and where the idea of the company is born. Stakeholder perspective includes the various parts and people that are connected to the operations of the company and in order for a company to act according to the policies of CSR, it has to look further ahead and not merely in quarterly fashion. (Werther & Chandler, 2006) Figure 2 demonstrates different stakeholders operating in the organizations'' immediacy.

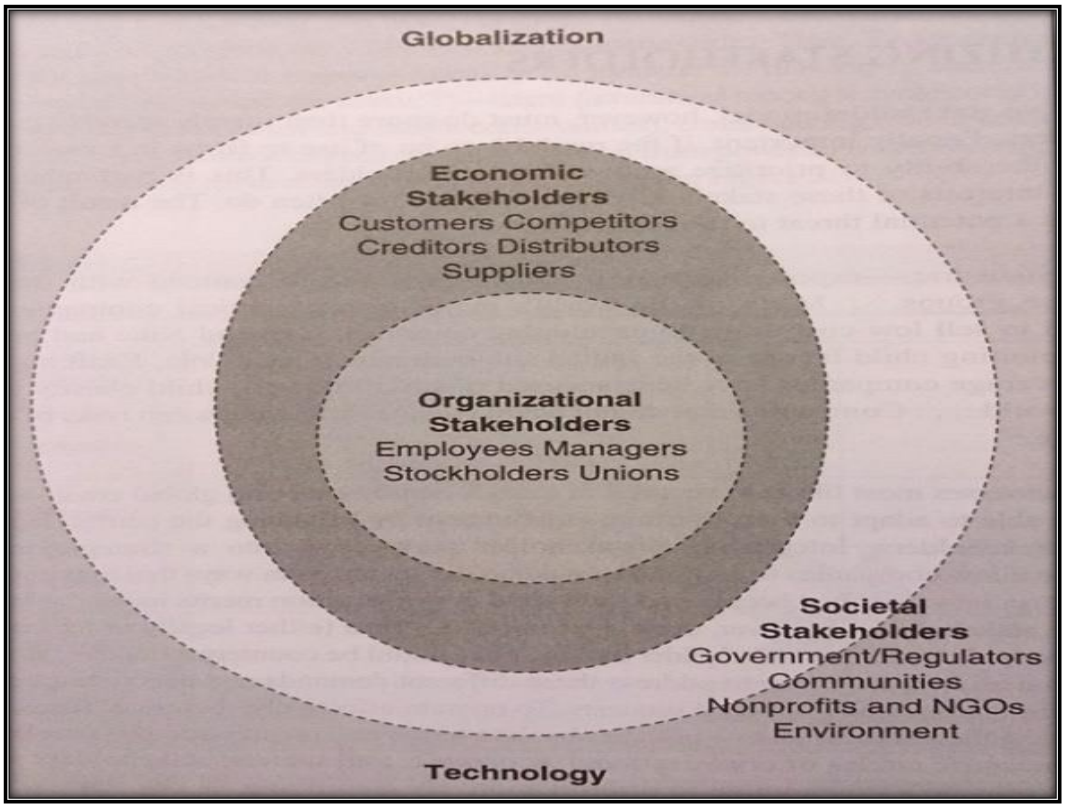


Figure 2. “Different stakeholders” (Werther & Chandler, 2006)

Stakeholder engagement is one of the most important aspects in CSR. Stakeholders presented in the figure 2 are closely linked to organizations and companies CSR strategy. Corporate social responsibility aims to take into consideration the interest of its stakeholders groups. It has been stated, that effective stakeholder management is one of the key reasons how successfully implement CSR. (Dobele, et al., 2014; Sangle, 2010).

When companies are implementing stakeholder strategies in a right and efficient way they can bring many benefits to a company but if the organization under-engage, they can also cause lots of damage. (Dobele, et al., 2014; Freeman et al., 2010, p. 95; Luoma-aho 2008, p. 4)

2.2 INDUSTRIAL SYMBIOSIS

This part presents the definitions of industrial symbiosis and how different terminology is understood in the academic literature as the concepts of Industrial symbiosis, Industrial Ecology and Eco-Industrial Parks are sometimes presented as synonyms. Later there is an introduction to the development of industrial symbiosis from the historical viewpoint. In the end there is a presentation and how industrial symbiosis contributes to the sustainable development.

There exist no specific standards of how industrial symbiosis can be defined, as there exist many definitions that have been given to it. Variations on the terms, content and the choice of words as well as actions all place an interesting complexity around IS, but even though there exists innumerable modifications on the matter as do with concepts of CSR and sustainability, in the very core of IS remains the simplistic idea about the sustainable exchange within certain clusters that promote the sustainable development as well as offer synergistic opportunities with economic advantage. (Yu, et al., 2013)

Continuing to define industrial symbiosis, Posch (2010, p.243) proposes to include the geographical aspect in the concept of industrial symbiosis and the definition states:

"The main idea is to design industrial systems so that the by-products ("waste") of one company are used as raw material by another company. The aim is to minimize industry's impact on the environment by forming closed loops of material and energy use within the industrial system. Consequently, the concept of IE typically is applied at a local or regional level rather than at the level of a single company."

Industrial symbiosis can be given a meaning through companies providing environmental as well as competitive benefits from the social or technological resources. It is about an assemblage of long-term and symbiotic relationships between and among organizations that are located in the regional proximity from each other involving the exchange of knowledge but also an exchange of materials and energy. (Posch, 2010)

2.2.1 Industrial symbiosis, Industrial Ecology and Eco-Industrial Parks

Industrial symbiosis study field has developed from the research agenda of industrial ecology with among others such as supply chain management and eco-industrial parks. (Schiller, et al., 2014, p.4) However, "These fields have introduced new methods and theories from other disciplines where they were considered coherent with the epistemic perspective of industrial ecology. "(Schiller, et al., 2014, p.4)

Theoretically speaking, even though industrial symbiosis spawned from the study of industrial ecology, many studies refer to them as synonyms. The definition for industrial ecology is as follows;

"The field of industrial ecology can be considered to be "*the study of the flows of materials and energy in industrial and consumer activities, of the effect of these flows on the environment, and of the influence of economic, political, regulatory and social factors on the flow, use and transformation of resources" (White, 1994, p.v.)*" (Schiller, et al., 2014, p.1)

Compared to another definition proposed on Industrial Symbiosis itself, and which is requently referred in the academic literature, comes from Chertow (2007, p.12) who has given a meaning to industrial symbiosis by arguing that:

"Engaging traditionally separate industries in a collective approach to competitive advantage involving physical exchange of materials, energy, water, and by-products. The keys to industrial symbiosis are collaboration and the synergistic possibilities offered by geographic proximity"

Hence, in this study an industrial symbiosis can be referred to as an industrial ecology, or sustainable networks or clusters as they are all defined within the same ground principles. (Schiller, et al., 2014, p.1; Posch 2010, p.243; Chertow 2007, p.12; Posch)

The same ground principles apply also to Eco-industrial parks that have resulted from the the study of industrial symbiosis and it is defined as the practical side of the industrial symbiosis resulting in more concrete actions towards sustainability;

"These systems extend the familiar concept of an industrial park to include the symbiosis concept, with the goal of optimizing the relationships among the components of the system, including the ecological environment, thereby increasing the system's overall efficiency and the likelihood of sustainable development" (Zhang, et al., 2013, p.169)

Throughout this study, they are all used in synonym purposes which refer to the same definition given to it, but this study will mainly hold on to the terminology of industrial symbiosis, industrial ecology, sustainable networks or clusters for the sake of an academic clarity.

According to Chertow (2007), because there exist so many variations of different definitions about IS, there should be certain things that industrial symbiosis are expected to include. These are for example environmental benefits of IS, even if these benefits have not yet been so carefully measured in the previous academic literature that are conducted over the matter. But to consider this sustainable exchange model from the general perspective there exists three primary opportunities for resource exchange in symbiotic relationships and they are:

> "(1) By-product reuse— the exchange of firm-specific materials between two or more parties for use as substitutes for commercial products or raw materials.
>
> (2) Utility/infrastructure sharing—the pooled use and management of commonly used resources such as energy, water, and wastewater
>
> (3) Joint provision of services—meeting common needs across firms for ancillary activities such as fire suppression, transportation, and food provision" (Chertow, 2007, p.12).

These three phases demonstrate the key aspects that are involved when an exchange takes place and whether it can be considered to be part of the symbiotic relationships in industrial symbiosis. There exist actors who do not even know that they are part of IS or exchange waste networks. (Schiller, et al., 2014)

It is important to remember that exchange that takes place is affected by many aspects and hence taking into consideration many various perspectives in the matter will eventually provide a holistic picture about the whole industrial symbiosis. (Chertow, 2007)

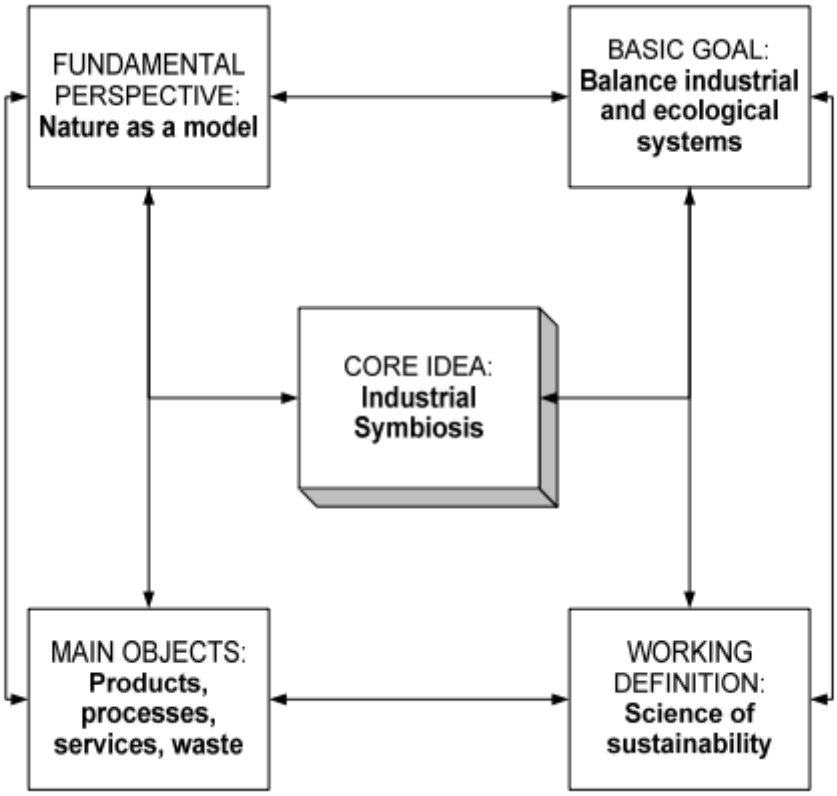


Figure 3 “Industrial symbiosis” (Aparisi, 2010)

Figure 3 captures the basic elements of industrial symbiosis in a simplistic way that helps to define the main goals and ideas behind these symbioses. To develop understanding for the industrial symbiosis, it can be described as a cluster of organizations that engage themselves in the exchange of waste or byproducts among the interacting firms with common objectives. “Resource consumption and costs are reduced through utilization of materials that would otherwise be classified as by-products or waste and jointly providing energy, water, and waste treatment services for associated partners” (Mattila, et al., 2012)

2.2.2 Historical development of Industrial Symbiosis

Even though the notion of IS seems to be a novel thing because of its fairly recent interest in the media as well as in the academic literature, exchanging products such as animal parts have existed around since ancient times of people (Chertow, 2007, p.12) This exchange that have developed to meet the needs of the present standards, the history sheds light to the matter by pointing out that entrepreneurial actions through which the by-products of one industry become the valuable inputs of another, have always shared a one common denominator that is the need for close by proximity in geographical sense of the exchange parties involved. (Desrochers, 2002, p.13)

The model of industrial symbiosis follows the framework of Cradle-to-Cradle theory that have been developed to describe in very similar manner the cyclical approach of waste exchange that is developed in sustainable networks. The difference is that this approach is used to describe the cyclical movement of concrete products where as IS is used to describe a certain industry in a certain environment. Cradle-to-cradle is a framework for products to describe the design of products and systems that imitate natural metabolism of nature." It's the ultimate in closed-loop thinking." (Balch, 2012)

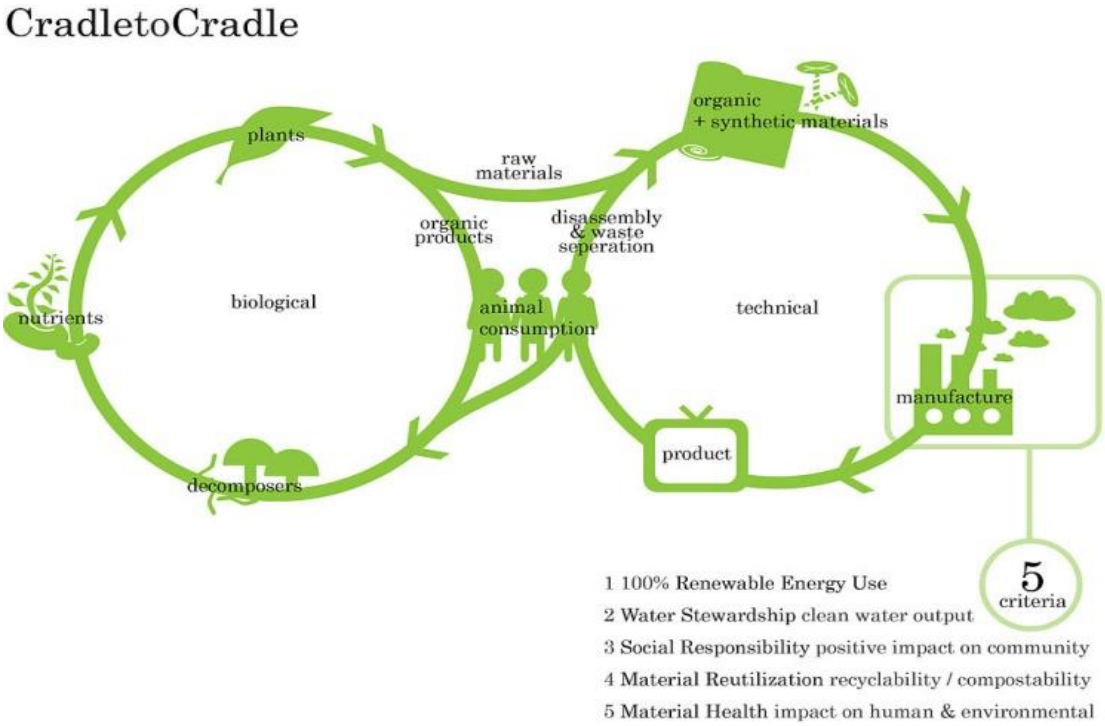


Figure 4. "Biological and technical nutrients (C2C)" (Fuhrmann & Ma, 2010)

Figure 4 presents a chance to view cradle-to-cradle aspects from the cycle of biological features as well as technical ones. The cradle-to-cradle ideology together with industrial ecology as well as indusyrial symbiosis, has gained a considerable attention especially in Netherlands where they are widely popular and various projects and organizations have risen around to it spawning many succesful ideas to support world's economy in a sustainable manner with renewable resource usage and producing a concept that sheds light how companies can have positive impact on society and environment. (Balch, 2012)

2.2.3 Sustainable development from the industrial symbiosis viewpoint

Sustainable development and sustainable economy are one of the focal issues concerning everyone from individuals to companies. Sustainable development includes in itself the very potential to state what are the fundamental trials as well as prospective actions for humanity, in present and in the future. (Hopwood, et al. p.38; Steurer, et al., 2005)

It is argued that the definition that was given to sustainability by Brundtland stresses solely the qualitative attributes and not the quantitative ones which give companies opportunity to

roam in the vague outline of sustainable definition through the exploitation of environmental resources. (Hopwood, et al., 2005)

Workshop on Urban Sustainability of the US National Science Foundation (2000, p. 1) argued that due to the many definitions, sustainability is "As the laden with so many definitions that it risks plunging into meaninglessness, at best, and becoming a catchphrase for demagogy, at worst. [It] is used to justify and legitimate a myriad of policies and practices ranging from communal agrarian utopianism to large-scale capital-intensive market development"

Because of this vague definition, it shows that industrial symbiosis offers a valued viewpoint to sustainability when it gives alongside qualitative measures also the quantitative ones and a clear goal how to approach the environmental, social and economic standpoints. It gives sustainable development clear objectives concluded with the efficient use of resources, reducing environmental impact while supporting economic realizations. (Corder, et al., 2014)

Not only will IS offer a sustainable development an overall approach from the industrial viewpoint, it also reaches out further by giving people chance to follow a real-life example of an environmental development within networks that function in a collective manner towards sustainable goals as well as fulfilling their economic as well as social aspect in many arenas bringing overall benefits to all parties involved. (Corder, et al., 2014 & Beyene, 2005)

2.3 STAKEHOLDER ENGAGEMENT

The final part of the thesis will present stakeholder engagement and how it can contribute to the development of industrial symbioses. As it has been mentioned in the previous chapters the importance of social relations in CSR and IS are vital in order for these concepts to function. As the CSR sets guidelines and responsibilities what can be considered as responsible actions for companies, industrial symbiosis is a way to realize those responsibilities in the actual business life. This can be accomplished through stakeholder engagement that functions as a bridge between these two concepts.

First this chapter will start with a presentation of different types of stakeholders and how they can be recognized. After this the stakeholders affecting the development of IS are presented. Then different incentives to develop industrial symbiosis are presented and the contribution of stakeholder engagement in them is demonstrated. In the end stakeholder engagement will be examined through a strategical approach in the development of Industrial Symbiosis.

2.3.1 Types of stakeholders

The concept of stakeholders is essential to CSR (Maon, et. al., 2009, p.72) as it is also, to industrial symbioses (Aparisi, 2010; Chertow, 2007; Beers, et al., 2007). It has been stated that stakeholder engagement is a key to successful CSR programs (Heismann, 2014; Maon, et. al., 2008). CSR is a growing dialogue between the company and its stakeholders and this dialogue that exists is one form of CSR. (Bhattacharya et. al.. 2008, p. 257; Freeman 2010, p.195, p.235) Different stakeholders in industrial symbioses play a vital role for the successful development of these clusters. Stakeholder engagement minimizes the risk of failing and aids to engage different companies in successful business opportunities. (ZHANG, et al.2013, p.103)

Challenges may arise if the company does not reach the right stakeholders considering its operations. (Marom , 2006, p.199). For this reason stakeholder theory is relevant especially companies operating or planning to work in industrial symbioses.

Companies have different kinds of stakeholders. These stakeholders are organizational stakeholders that are internal to the firm such as employees, managers, stockholders and unions. The second group presents economic stakeholders that are customers, creditors, distributors and suppliers. Third ones are societal stakeholders that present the external actors of the company such as communities, government and regulators and environment. (Heinonen, 2014)

From the wider perspective there exist five types of stakeholders that present stakeholders in different areas affecting companies' operations and those are as follows: (Werther & Chandler, 2006)

1. Organizational Stakeholders
2. Economic Stakeholders
3. Social Stakeholders
4. Global Stakeholders
5. Technical Stakeholders

Stakeholder engagement theory was built to solve three problems which were linked to mapping out the companies working environment. It remained unclear how companies should react to their environment and also, companies wanted to bring clarity to business thinking and everyday ethical problems. There also existed a need for change in the thinking of leadership when world became more and more global. Stakeholder viewpoint combined ethical and business orientated ideas naturally together which meant that the other did not become rejecting another one, but they succeeded to work in harmony. The very core idea of stakeholder engagement is to add value for every actor in the company's environment. (Heinonen, 2014; Freeman et. al., 2010, p.4)

According to the general opinion, companies are in a constant effort trying to balance between two interests groups – shareholders (people who own the company) and stakeholders (other people who are affected by the operations of the company). The matter is not this simplistic and choices that investors make concerning companies are nowadays also reflected from the needs of social responsibility that companies engage themselves. Companies that are only responsible for the owners do not present a modern idea of business thinking. (Heinonen, 2014 & Freeman et. al., 2010, p.10).

Companies are acting in a responsible way when stakeholders accept companies' actions. Some writers such as Freeman (2010) suggest that the companies that behave in a socially responsible way should be called the company's stakeholder responsibility, because CSR is all about taking into consideration communities and environments stakeholder responsibility. (Heinonen, 2014 & Freeman et. al., 2010).

2.3.2 Recognition of the key stakeholders

Different CSR strategies should precisely aim to certain stakeholders in order to achieve the most efficient results. (Bhattacharya et. al. 2008, p.257 &272; Sachs & Maurer 2009, p.535; Marom 2006, p.199). There are natural limits to growth and the modern business world needs to consider and understand the development of novel industrial processes that target doing business in a sustainable way and formulate the business according to the paradigm of cyclical thinking. (Pluijm, et al., 2010, p.204) In order to build CSR programs companies need to identify the right set of stakeholders. (Dobele, et al., 2014)

The figure 5 shows stakeholders in a wider scale. Figure is presented in order to show how many actors can operate as organizations' stakeholders and how can companies recognize their important stakeholders.

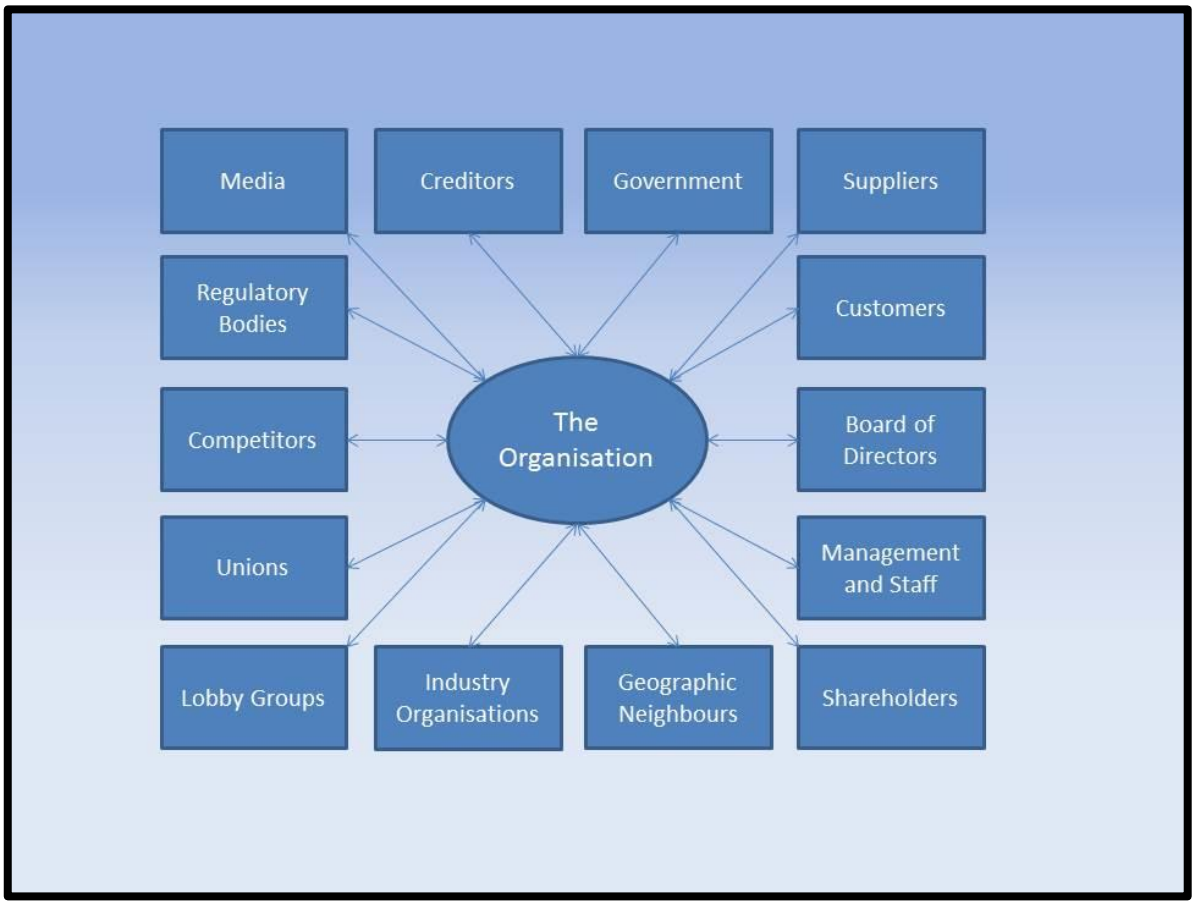
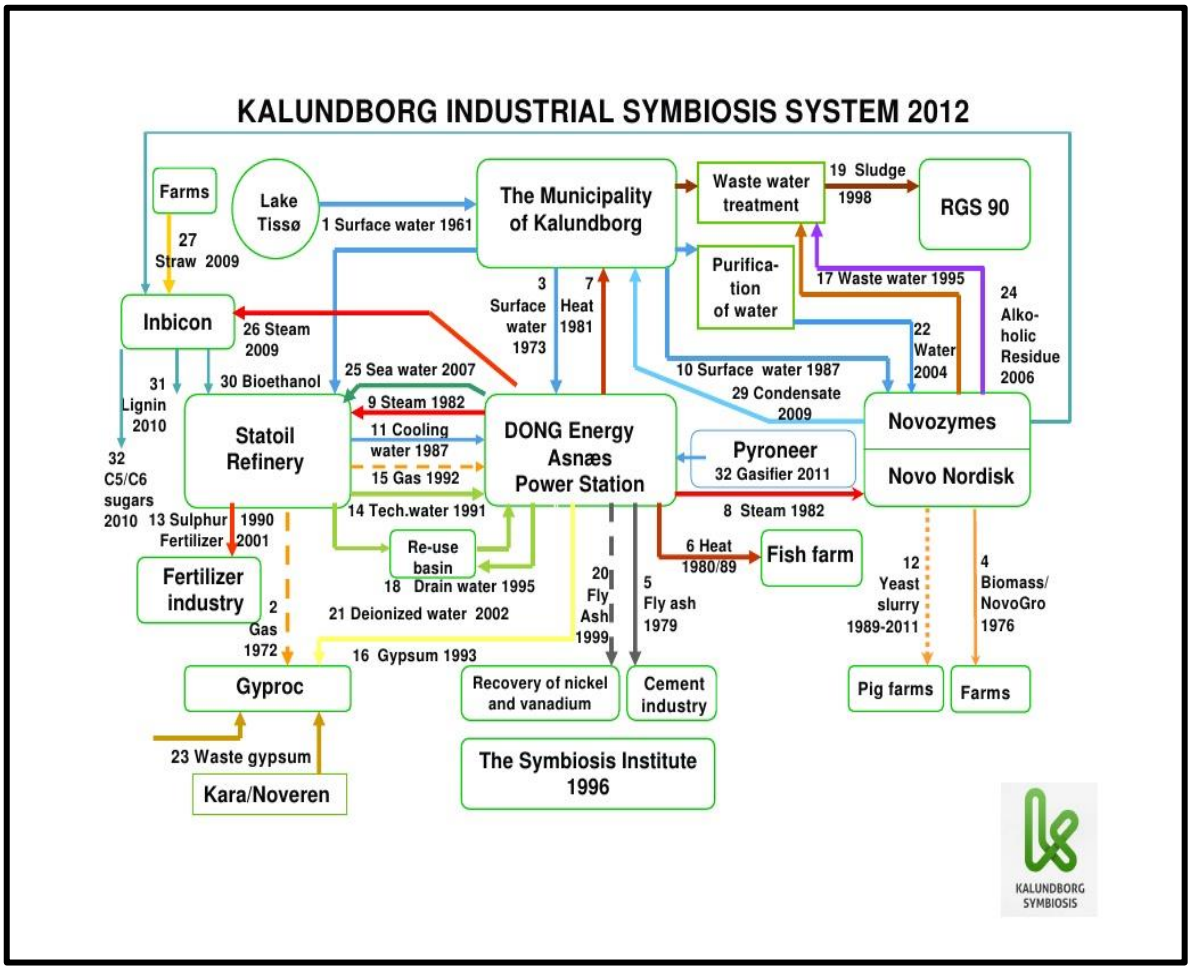


Figure 5 "Stakeholders". (Professional Academy, 2016)

As the figure 5 presents the diversity of the stakeholders it becomes more obvious why finding right ones can appear to be problematic. These stakeholders can be customers, employees, suppliers, collection and refurbishing partners, processing providers and local authorities. Industrial symbiosis is about engaging multiple stakeholders in order to bring new business opportunities as well as resource savings. (Aparisi, 2010) It is not always realistic for the companies to reach for all categories of stakeholder groups, hence the management has to make a commitment to identify and select the right stakeholder according to the importance, power or legal aspect of the stakeholder. (Dobele, et al., 2014)

Figure 6 is presented that shows the relation between different actors in the symbiosis and the possible stakeholders operating in it. For this purpose a picture of Kalundborg has been used and as it presents the relation between different actors and what types of resource exchange is taking place in it. For the purpose of these symbiosis to be successful there needs to be a robust management that engages different stakeholder in order to generate new business models where companies can benefit financially and environmentally.



The figure 6 “Kalundborg industrial symbiosis” (Skovbjerg, 2012)

The figures 5 and 6 demonstrate the complexity of stakeholders but also display the business opportunities that exist in them. Studies have pointed out that to recognize the right stakeholders an external help is required. (Yu, et al., 2013; ZHANG, et al., 2013)

2.3.3 Stakeholders influencing the development of Industrial Symbiosis

According to studies, the most important thing is the interaction among stakeholders for creating industrial symbiosis. When these IS function, it is the basis of stakeholder engagement that can quarantee a joint vision of sustainable development. (Posch, 2010) There are studies that emphasize the importance of social connections within industrial symbiosis (Hewes & Lyons, 2008; Aparisi, 2010; Zhang, et al., 2013; Corder, et al., 2014)

and demonstrate that even in the presence of promising material conditions “IS relations are unlikely to develop or acquire richness and complexity unless they are supported by a well-developed knowledge network. The findings also confirm that the knowledge network relies heavily on the degree of development of social mechanisms of control and aspects such as trust and reciprocity.” (Aparisi, 2010)

There are numerous applications of industrial symbiosis, particularly in heavy industrial areas around the world, such as famous Kalundborg (Denmark), Forth Valley (Scotland, UK), Kawasaki (Japan), Rotterdam (The Netherlands), Map Ta Phut (Thailand), and North Texas (TX, USA). (Corder, et al., 2014) According to estimations there are over 50 regions that show a sign of development of industrial symbioses. (Corder, et al., 2014) All of these symbioses offer a synapsis of various sustainable networks that create their own unique exchange patterns in the pursuit of sustainable development.

According to many studies these symbioses are expected to develop spontanously in order to be succesful which explains the accomplishments of Kalundborg where it developed a vast network of exchange that brought environmental and economic benefits to all parties involved. (Behera, et al., 2012, Chertow, 2007)

Projects conducted mainly in the United States and Canada pointed out that the case of Kalundborg was unique and the idea behind it could not be copied so easily in other locations due to multiple barriers involving the transaction costs of searching for suitable waste or by-products, profits on material flows, the technical problem of continuous sources of feedstock, and the cognitive capability of firms (Yu, et al., 2013)

Even though according to most of the studies, the majority of successful symbioses such as Kalundborg have developed spontaneously, there are correspondingly examples of policy instruments that can promote the development of these industrial symbioses. (Mattila, et al., 2012). Scholars are interested in finding the attributes that are operating in the developing of industrial symbiosis. (Yu, et al., 2013) In Australia the formation of industrial ecology proved to lie on the basis of social factors and Corder, et al., (2014) argued that “critical success factors were the development of a trust, to develop the concept and bring together government and industry to secure ongoing support for the project.”

Other studies support the argument that the social relations are the most important ones in order to make these symbioses successful, hence it is not relevant how the clusters are born. (Hewes & Lyons, 2008) "A range of barriers and enablers to industrial ecology development have been addressed in literature, including the role of government environmental policies, planning policy, management practices within the industries, and a lack of specific tools to organize and stimulate the inter-industry collaboration" (Corder, et al., 2014) Also Posch (2010) raises the issue of sustainable development of being something that is pursuit after by a group of people and it is this very particular group who will determine how these sustainability networks develop.

2.3.4 Incentives to develop industrial symbiosis

Milton Friedman has said "There is one and only one social responsibility of business–to use it resources and engage in activities designed to increase its profits so long as it stays within the rules of the game, which is to say, engages in open and free competition without deception or fraud". (Friedman, 1970) This is a known reference that is used in academics in order to show the one and only responsbility of the company – to increase financial profits. But nowadays, more than ever, companies aiming only to make profits is not a moder day view of company's responsibilities. (Werther & Chandler, 2006)

Corporations are placed in a situation where they are increasingly being held responsible for the social and environmental consequences of their activities. (Dobele, et al., 2014; Werther & Chandler, 2006) Firms produce a lot of things that are considered good in our societies but at the same time they are accused to cause harm such as pollution etc. (Werther & Chandler, 2006, p.17)

There exist countless motivations behind the pursuit of companies entering in industrial symbiosis. To name the first obvious one is the most ancient and conventional business reasons – reducing costs that are caused by the exchange of the materials or for example, resource sharing has a possibility to increase revenues. But to think about this from another level, it can be argued that industrial symbiosis can improve long-term resource security. (Chertow, 2007, p.13)

Improving long-term resource security is to be affected by the increase of the availability of critical resources. These resources include water and energy, or any given particular related to raw materials that are under the exchange through contracts. But there also exist some cases, that when a company goes after a symbiosis, it is due to response to regulatory or it might be because of a willingness to increase efficiency of resource use, or to get a chance to diminish emissions, or reduce waste.(Chertow, 2007, p.13).

The findings of Aparisi (2010), who identified a certain number of factors that operate as incentives for the emergence of industrial symbiosis networks, there is a possibility to draw a list that functions as a guide for incentives in IS:

Table 3 "Incentives to enter into Industrial symbiosis" (Aparisi, 2010)

1) Stringent environmental regulations	**2) Shortage of essential raw materials and/or the existence of large volumes of high value by-products**
3) The need for customized solutions that require close collaboration	**4) The existence of an underlying business macro culture of cooperation**

Table 3 demonstrates incentives for the development of sustainable networks. These incentives and key factors of developing sustainable networks are under academic interest as they are still recently new for the theoretical studies. (Dobele, et al., 2014; Chertow, 2007)

The question is whether the company and its management can recognize the right stakeholders that are affecting and can offer novel business prospects for all the actors in these collaboration strategies. There have been examples in the academic studies where companies have been operating in industrial symbiosis without realizing that it is actually

working in one. This naturally means lost profits that the company might encounter if not pursuing stakeholder engagement with the right partners. (Behera, et al., 2012)

This leads to the question that how is it possible for a company to recognize different stakeholders and possible partners that might produce new business innovations.

2.3.5 Incentives to develop industrial symbiosis through stakeholder engagement

Stakeholder engagement is offering a strategical approach to understand the pros and the cons when engaging with different stakeholders or if under-engaging with them. The figure 7 states benefits and different possibilities when company is strategically using stakeholders in the development of industrial symbiosis.

Sources of Value Creation	Benefit/Opportunity of Engaging	Cost/Risk of Under-engaging	What's Possible
Resilience: Tracking socio-political and environmental issues	• Issue identification • Preparation: Mitigation & Adaptation • Co-creation and collaboration on solutions	• Absence or loss of trust • Lack of preparation for crises • Negative media • Costly cleanup • Damage control • Stock market losses	Resilience: the ability for both the business and its operating environment to resist impacts
Reputation: Monitoring and managing stakeholder expectations	• Reputation capital • Trust • Reputation Management • Network of 3rd party reputation defenders	• Absence or loss of trust • Unmet expectations • Crisis & damage control • Negative media • Stock market losses	Renewable Reputation: a potentially limitless source of reputation capital
Alignment: Understanding stakeholder values and ensuring CSR program impact	• Optimize and validate program investment • More effective and measurable impact • Increased budget • Reinforcement of results	• Ineffective impact/results • Underperforming financial investment • Demotivated team • Difficulty justifying budget	Virtuous Value Creation: alignment and stakeholder relevance increase measurable results, investment and, in turn, social good
Strategy: Sourcing the wisdom of the crowd and co-creating solutions	• Innovation • Differentiation • Capture market opportunities as they emerge • Co-create and collaborate	• Missed business opportunities • Loss of market share • Stagnant revenue growth • Un-utilized source of thought capital and initiative	Sustainable Competitive Advantage: a generous source of ideas to improve business outcomes

Figure 7 "Incentives to engage with stakeholders" (Heismann, 2014)

Figure 7 presents stakeholder engagement in the light of a strategical value creation. It highlights what are the benefits when engaging stakeholders and what might come if under-engaging. Company makes a strategic approach when it is emerging either in the CSR or/and IS through stakeholder engagement and this leads to novel business models. Strategy addresses how the firm competes in marketplace (its operational context) and CSR considers the firm's impact on relevant stakeholders (its societal context). (Werther & Chandler, 2006)

There exists a strong support for spontaneously developed clusters, but more and more studies have been able to demonstrate the key factors behind successful symbiosis whether they are structured or not and those factors relates to the social relations. (Behera, et al., 2012)

2.3.6 Stakeholder engagement as a strategical approach to the development of Industrial Symbiosis

According to many studies the key factors of successful sustainable networks are due to the strong social aspect as well as robust management created within and around the symbiosis. (Posch, 2010; Hewes & Lyons, 2008) Many studies point the failure of these symbiosis to be the lack of trust between partners and communication of intention. (Beers, et al., 2007) In addition, according to the studies conducted in CSR the lacks of resources and top management commitment have been identified as the biggest barrier for successful implementation of CSR. (Werther & Chandler, 2006) It is the very interaction among stakeholders in these symbioses that matters for establishing a common vision of sustainable development. (Posch, 2010)

A proposal has been made that states that CSR initiatives must be communicated to the relevant stakeholder groups and their answers monitored. (Dobele, et al., 2014; Maon, et al., 2009)

The findings from other studies support the statement and interviews conducted with industry representatives, indicated that “cooperation and trust” among industries and other stakeholders is the strongest characteristic of industrial symbiosis development. Hence one of the key aspects in governing successfully designed IS is to create a vigorous management structure that aims to have a supporting staff for each industrial symbiosis center. (Behera, et al., 2012)

When companies enter into long-term and symbiotic relationships they often need valid methods of communicating their intentions to others. Management operations and communication becomes a vital aspect for the success of these symbioses and it can determine whether or not sustainable networks will succeed or not. “However, in the

absence of effective communication channels among companies, efforts to transform the conventional industrial complexes into EIPs need to stimulate the development of symbioses with a systematic design approach." (Behera, et al., 2012)

One of the main reason why industrial symbioses in Australia did not succeed was the lack of trust between partners and with stakeholders. (Corder, et al., 2014) This indicates the complex relationship and its management problems within the concept of IS but also the opportunities it can offer for enhancing the functions of development and operating of industrial symbioses' management.

Building communication and interaction can happen by different means and by developing these means they can also develop trust between different stakeholders operating in the affluence of the company. "Interactions include *purchases*, *legal contracts*, *personal contacts* and actor constellations." (Schiller, et al., 2014), With these interactive approaches it is good to remember that the social networks in any businesses are important and because we are social creatures "Success in business requires dealing with human beings, which is to say conscious beings" (Kofman, 2006, p.2)

3. THEORETICAL FRAMEWORK OF THE STUDY

CSR and industrial symbioses are relevant now more than ever because, in a world where its constant companies are climate change, environmental crisis and other critical factors consuming our natural resources, the business markets are looking for novel approaches to implement new business strategies in a more sustainable manner. (McWilliams, 2015)

Corporate social responsibility has given many different definitions in the academic literature but one that covers many aspects of this vision is created by Russell et al. (2007) and it summarizes multiple different identifications that have been placed on corporate sustainability. According to Caroll (1979), he argues that all companies should strive to excel in all of these at all times. Russell et al. (2007) created aspects that cover CSR from various theoretical conceptions that have been demonstrated in other literature. The four aspects are as follows:

1. a corporation working towards long-term economic performance;
2. a corporation working towards positive outcomes for the natural environment;
3. a corporation that supports people and social outcomes;
4. a corporation with a holistic approach

While a variety of theories exist for CSR and its definitions, these four goals mentioned for its operations also function in industrial symbiosis. Industrial Symbiosis, as mentioned in the literature review, sounds appealing in various definitions that have been given to it, as it is metaphorically described to be the very reflection from the nature itself as everything is recycled in clusters and nothing is wasted. (Corder, et al., 2014; Posch, 2010; Beyene, 2005)

This close-looped thinking started getting the interest of the public when people found out about the waste exchange and resource-use efficiency applied in Denmark. These first studies were especially inspired by the spontaneously formed symbiosis in Kalundborg,

Denmark. (Yu, et al., 2013) This exchange of various features that were created through decades placed Kalundborg in the favor of many academic studies that have researched the formation and motivations of its operations. (Yu, et al., 2013) The empirical part of this research was conducted in Finland but who all possessed a comprehensive knowledge of international markets as well.

The literature reviewed studied how CSR and its stakeholder engagement could contribute to industrial symbiosis. Yet, there does not exist a theory that could define how combining stakeholder engagement into industrial symbiosis practices functions. In this research an approach was created grounded on a mixture from the ideas that emerged from literature review. The theoretical framework answers the basic problem of this study: "How CSR and stakeholder engagement encourages the development of Industrial symbiosis and its management?" The framework is presented in Figure 8.

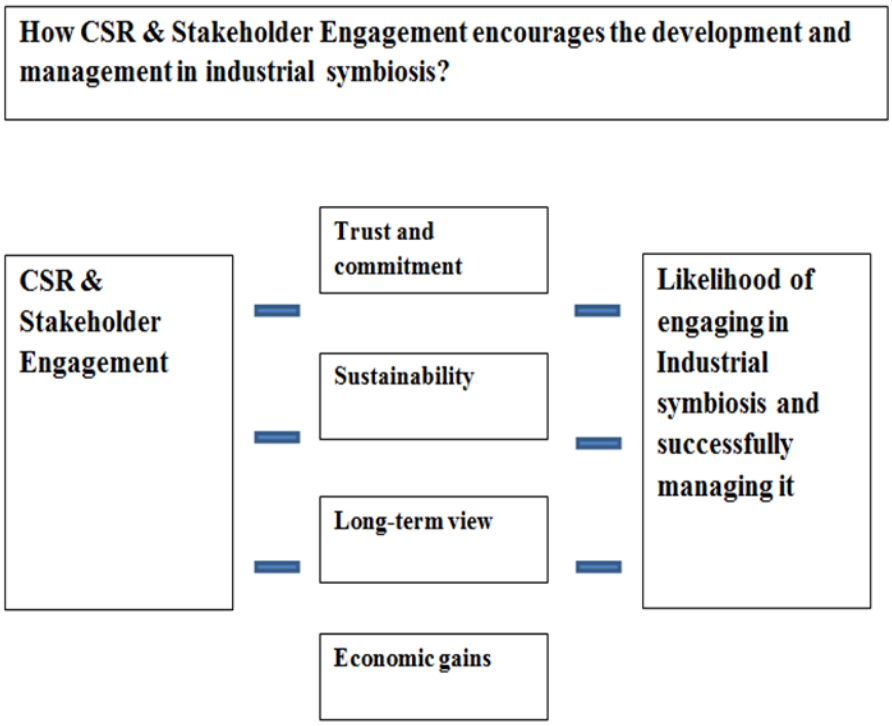


Figure 8 "Framework of the study"

As it was stated before there exist many similarities and social aspects that CSR and stakeholder engagement theories share with industrial symbiosis approach. The framework presented in this study aims to link CSR and stakeholder engagement to industrial symbiosis that can produce outcomes that can be beneficial for the societies' holistic sustainable development approach but also to the management working and interested in industrial symbiosis.

The following phase of the study is to find answers regarding the main research question and its sub questions. The framework developed for this study will be applied in the following chapters and its case companies. Methodologies of the study and case companies are introduced in the next chapter.

4. RESEARCH METHODOLOGY

This research aims to provide answers how CSR and stakeholder engagement influences to industrial symbiosis. The research is not focused in one industry, but it will concentrate of five experts in the field of industrial symbiosis and CSR.

This chapter will aim to present a research methodology and validate the means for carrying out the research. In the second part, the goal is to describe the methods for selection of these five experts and then data collection. In the final and third part, the study will enlighten about the data analysis method. In the final section, the study will interpret the consistency and validity of the study.

4.1 Research methods and approach

Research methods are qualitative with open-ended questions that seek to answer "how" and "what"-questions. These kinds of questions make this research a qualitative study. Qualitative research method is often used when there is a need for a better understanding of some phenomenon which needs the assistance for the processing of new facts (Strauss and Corbin, 1990). This method can be used in a situation where evidence is problematic to acquire through quantitatively directed methods of data collection (Guest et al. 2006).

For this research a case study method was used. A case study is defined as "Case studies, in which the researcher explores in depth a program, an event, an activity, a process, or one or more individuals. The case(s) are bounded by time and activity, and researchers collect detailed information using a variety of data collection procedures over a sustained period of time" (Neuman, 2000) One of the valid aspects of this kind of a method is that it provides means to study the phenomenon within its real life context. (Yin, 1994).

With case studies there is a possibility to choose either single or multiple cases. For the sake of the holistic method chosen for this study the multiple-case study approach has been applied. Ogbonna and Wilkinson (2003) have conducted a study that favors this kind of a design when there exists a need to study contextual data. According to the focus of the

cases' characteristics, the sample sizes are small; usually one to several cases (Guest et al. 2006).

Yin (1994) has stated that there are two possibilities that multiple case studies follow – either it is conducted on the basis literal replication or theoretical replication basic logic. For this study a theoretical approach has been chosen and also, the cases were selected by means of theoretical rather than statistical sampling. (Yin, 1998). "Theoretical replication (where the cases are designed to cover different theoretical conditions). In the latter case, one might expect different results but for predictable reasons" (Yin, 1998)

The cases selected in this study are all working in the industrial symbiosis or are familiar with the circular economy and have knowledge of the importance of working with stakeholders. All the companies chosen for the study are different in size but all share strong focus in industrial symbiosis and either professional experience or extensive knowledge of engaging in proactive stakeholder relationships.

4.2 Selection of case companies and data collection

The selection of case companies was done intensely and with time in order to get the right informants considering the qualitative nature of this study. As it was mentioned earlier the companies chosen for the study all shared their experience in the field of industrial symbiosis either by directly working in them or being professional advisers on the matter.

The interviews are an important part of this thesis and the time gathering and finding the right interviewees formed a substantial part. The information for each case has been gathered through interviews. Qualitative research considers in-depth interviews technique to be optimal when conducting research on experiences and practices. "In-depth interviewing is a qualitative research technique that involves conducting intensive individual interviews with a small number of respondents to explore their perspectives on a particular idea, program, or situation" (Boyce & Neale, 2006, p.3)

All the interviews were voice recorded with permission of the interviewees. After this the information that had been collected were analyzed and there were different patterns that were linked together using tables, list or by writing participants' statements down.

Theoretical sampling was used when the choices were being made of the interviewees. It was important for this study that the informants possessed information on both of the subjects' concerning CSR and stakeholder engagement as well as knowledge about industrial symbiosis. When finding the right applicants for the interview the candidate needed the following attributes:

1. Preferably an industrial symbiosis expert or in a management position: OR an expert with a relevant experience concerning industrial symbioses
2. A decision maker in regard to industrial symbiosis development.
3. Working experience in the industrial symbiosis
4. Knowledge about stakeholder engagement

Therefore, the aim of the research was to get a wider representation of stakeholder management practices regarding industrial symbiosis by constructing interviews predominantly with informants that have appropriate knowledge and experiences in the field.

The participants were widely interested in the topic and all shared the same passion in developing industrial symbiosis and its business opportunities further. Cases include interviews either with people who had their own company connected to industrial symbiosis or big industrial organizations sharing collaborative functions within the industrial symbiosis. All the informants worked in a position where they could affect the strategical decisions of the organization.

There were 5 interviews in total with 5 different companies. Two of the interviews were conducted at the interviewee's place of work and three with skype due to the geographical limitations. The interviewee's details are provided in Table 4. The interviews were conducted anonymously hence the names created for the companies are imaginary.

Table 4 “Background of the interview participants”

No.	The company name	ID	Position	Interview method	Interests in CSR and IS
1	Alpha	A1	Environmental Manager	Skype	Environmental specialist in waste management sector. The person shared great interest in the topic through the work as well as hobbies. Has been interested in the topic many years and has affected the field in interviewee’s own geographical area.
2	Beta	B1	Sales & Business Development	In-person	Works in industry where novel and innovative methods are being produced within the IS. Own work is about developing new partnerships that can all benefit from the collaboration. Renewable energies are key interests.
3	Gamma	G1	CEO and President	Skype	Authorized energy auditor and global business consultant with over 20 years of experience. Has been key architect of a few new businesses and national programmes like Finnish energy efficiency agreements.
4	Delta	D1	Senior Expert	Skype	Specialties: industrial symbiosis, resource efficiency, circular economy, application and development, new methodologies and tools, communication of results, standardization projects.
5	Omega	O1	Leading expert	In-person	The person has worked through different projects in developing industrial symbiosis. Key interests in environment, renewables and resource efficiency.

All the interviews lasted approximately an hour. Before the interviews were conducted the email exchange took place where the aim of the thesis was explained and research scope offered. The interview questions were created using the literature review on the matter that was conducted in a first phase of the study and it was used to in creating a framework around the research question and its sub-questions.

The first part of the questions evolved around the definition on industrial symbiosis and CSR in order to bring clarification on the matter that was the interviewee familiar with the topic and could the participant bring an own perception on the matter because there does not exist a clear definition on either of the subject. Also the first part aimed to cover that what are the similarities between these concepts.

The second part of the questions aimed to bring a management viewpoint to industrial symbioses and formulated questions in order to bring answers to questions that could help assessing the importance of social relations in the industrial symbioses. Questions such as "How important are social aspects (communication with stakeholders) in the management of industrial symbiosis?" and "Can you think of other factors that are important for the success of industrial symbiosis?" as well as "What are the biggest challenges concerning industrial symbiosis from the management viewpoint?" were presented.

The third part studied the strategical implementation of industrial symbioses with stakeholder engagement approach and aimed to show how beneficial different activities of engaging stakeholders in the process might prove out to be. Questions can be found from the appendix.

4.3 Data analysis

As it has been stated earlier a qualitative approach has been chosen for this analysis. To share the idea of Michael Quinn Patton (2005) "Qualitative analysis transforms data into findings. No formula exists for that transformation. Guidance, yes. But no recipe. Direction can and will be offered, but the final destination remains unique for each inquirer, known only when—and if—arrived at" (p. 432).

Due to the chosen approach of this study, when the data was gathered the main ideas of each participant's answer to the question were written down and later the voice recording was listened and coded in different categories related with the topic. The framework created for the study guided the collection and coding of information. It is essential to identify and refine vital concepts of qualitative research. Occasionally, this kind of conceptualizing starts from simple statement that is interpreted directly, then it is broken into pieces, and after this it is combined with more holistic approach and has given a more meaningful connotation.

The first part of the analysis aimed to categorize different themes that were brought forth from the collected facts. This method is commonly referred to as "open coding". (Strauss and Corbin, 1990). Data reduction was performed from the very beginning to end of the research project.

The last phase aimed to combine different viewpoints that the participants had presented. Purpose for this was to create an overall approach to see how stakeholder engagement can contribute to the development of industrial symbiosis. Finally, the cross-case data assessment based on analytic induction where research logic is used to collect data, develop analysis, and organize the presentation of research findings to compare information across cases. (Baltes & Smelser, 2001). Figure 9 aids to study, what process has been used in the collection and analysis of the data.

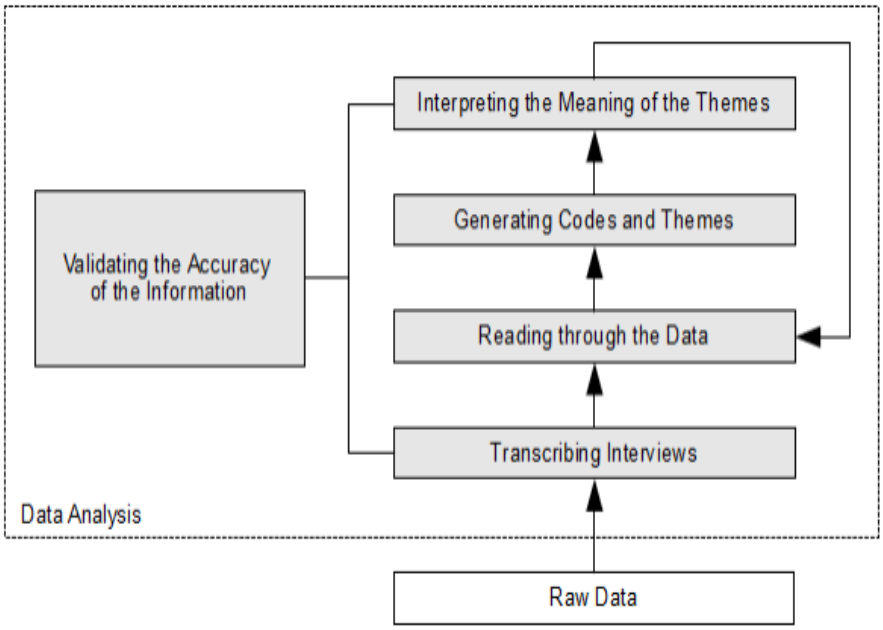


Figure 9 "Steps of qualitative data analysis" (Creswell, 2009)

As it was stated before these steps mentioned in the figure 9 has given guidelines for the construction the analysis part of the thesis. In addition to this, research findings were discussed against findings from the literature review.

4.4 Reliability and validity

No set of standards exist for evaluating the validity or authenticity in a qualitative study but it all starts with the collection of information. That is the very starting point of a trustworthy research. So it was with this research also, that the emphasis was laid from the very beginning to craft and find out the relevant information that can bring its contribution to this thesis. This thesis was carefully crafted in considering the evidence and methods on which findings were based.

Great importance was laid on finding the right participant for the interview. There can also be validity and reliability of the study when the interviewees give similar answers about the same topic or when participant refer to the same fact. (Alasuutari, 1995).

It is important to notice, that one of the main encounters when evaluating the legitimacy of qualitative research is the need to create the correlation between those associations that are under the scope of the study (Flick, 2009). In the end the fact remains, that the weight of information cannot be examined with full certainty because the event also occurs independently.

As it was mentioned earlier the aim of this thesis is to provide means to show and demonstrate trustworthiness hence part of the validity is developed from the professional experience and consistency of interviewees in the area being studied. For this reason the information that the informants have and professional experience were paid careful attention sampling was done. This was due to the fact that if inappropriate informants would contribute to the study it could mean obtaining meaningless and invalid data (Godambe 1982).

5. RESEARCH FINDINGS

This part will present the research findings. The whole analysis aims to answer the main research question that how CSR and stakeholder engagement encourages the development of Industrial symbiosis from the management viewpoint. Through different sub questions it sheds light to different sections of the analysis and aims to build a coherent picture of different phases of management, stakeholder engagement and the development of industrial symbiosis.

Companies were given cases names in this thesis and they were "Alpha, Beta, Gamma, Delta and Omega". First the companies are presented and given the main facts of industry where company operates and the position of the interviewee but due to privacy of case companies, more detailed explanations cannot be given. But all the case companies share strong knowledge of CSR and industrial symbiosis and its current as well as future possibilities. All the participant are either working in a company that are a part of industrial symbiosis in a position where they can affect the company's decisions or are experts in the field.

In the first part there will also be a presentation of how case companies have defined CSR, stakeholder engagement and industrial symbiosis and emerging of them. Second, research questions are answered by analysis of stakeholder engagement in industrial symbiosis through the information provided the interviewees.

5.1 Description of case companies

As industrial symbiosis does not exclude any actors that can operate in it or for it, the chosen informants and companies present a wide scale of different contributors to this analysis.

Table 5 “Background of the companies.”

Company’s name	Industry	Position and ID’s
Alpha	Waste management	Environmental Manager A1
Beta	Biofuels	Sales & Business Development manager B1
Gamma	Cleantech	CEO and President G1
Delta	Specialists in industrial symbiosis	Senior Expert D1
Omega	Consulting	IS consulting O1

Table 5 sheds light on the industry where case companies operate and also makes it easier to follow later in the analysis each answer’s background and from which industry it is reflected.

5.1.2. Emerging of CSR and IS and key definitions by case companies

The first part of the interview questions aim to find definitions to CSR and IS via interview participants’ own opinions and would these definitions relate to the ones given in the academic literature.

All the interviewees were able to give coherent answers of what does industrial symbiosis, CSR and stakeholder engagement mean. Even though the choices of words varied and the terminology used were different by some informants, the core idea in all the answers stayed the same.

By asking people to define these concepts, it could be made clear for the research purposes that the interviewee were familiar with the concepts in question. Also the fact that no

cohesion has been found from either of the definitions from the academic literature and it has only gained guidelines what it is; hence it was in interest for future studies to hear how professionals working in the industrial symbiosis understand the definitions of these aspects.

5.1.3 Definition of CSR and stakeholder engagement

Case companies were asked to define CSR from the management viewpoint and stakeholder engagement. The answers aligned with each other and there was a clear emphasis in the proactive attitude of the companies strategically following CSR and Industrial symbiosis. Couples of examples from the case companies' answers were as follows:

"Company's responsibility about the surrounding society and CSR management is about going beyond the legal aspect. Not solely the main responsibilities but also taking a proactive attitude and minimizing the environmental harms."(A1)

"Companies take the responsibility of their own actions and about the environment they are operating in. Organizations are taking into consideration not only the internal processes but also the other stakeholders as customer, suppliers and other operators whom the company is affecting with their operations."(B1)

The interviewees all saw the importance of going beyond the legal requirement and doing more in the co-operation with others.

5.1.4 Definition of Industrial Symbiosis

Most of the participant used almost the same definitions for the industrial symbiosis with each other.

"I define industrial symbiosis as a network where partnerships are born through the development of using other companies' wastes or byproducts as resources" (A1)

“Industrial symbiosis is a situation where two companies can benefit from each other when they are sharing something together that creates a win-win situation.”(B1)

“Other company’s waste is other company’s resource. Making business outside the company’s organizational boundaries.” (G1)

The same definition can be found from the literature where there is the recognition of the waste management and sustainable networks that create financial profits. Case companies also offered lots of great examples of different situations where industrial symbiosis has developed and how different companies work in collaboration with each other. Due to the anonymity there is not a chance to go in more descriptive analysis of those examples, but making business outside the organizational boundaries can benefit in groundbreaking results in theses symbiosis in different fields.

5.1.5 Responsibilities of CSR and Industrial Symbiosis

Informants were asked what they consider of CSR, stakeholder engagement and IS to include in their definition. All the interviewees were familiar with the concepts and could highlight the main responsibilities. After initial coding all the five tables created from the answers of the case companies were the same because informants answers aligned hence only one table is presented that present the results of the answers.

Different interviewees emphasized different approaches, for example A1 stressed the importance of pro-active engagement in all the fields when G1 raised the economic gains through innovative and sustainable actions and ideas that companies produce through their core operations. B1 stressed the meaning of strategical choices that the company makes in order to fulfill these responsibilities.

Table 6 presents accountabilities already stated in the other academic sources and aims to understand how well the participants’ answers align with the present literature and lays the foundation to emerging these different concepts and what similarities they share together. There were no given definitions about the concepts for the informants and they had a

chance freely describe how they saw these concepts to be. The table 6 was later coded based on the answers that the participants provided.

Table 6 “Main responsibilities of the different concepts”

Responsibilities	CSR	Stakeholder engagement	Industrial Symbiosis
Economic	x	x	x
Environmental	x		x
Ethical	x	x	
Legal	x	x	
Discretionary	x	x	x

As the table 6 present, the coding of these three concepts presents the similarities of them. Even though stakeholder engagement is under the concept of CSR, in here it is presented individually due to its important nature as a bridge builder between these two concepts. As it was stated in the literature review stakeholders are closely linked to organizations and companies CSR strategy as well as IS operations. The companies are not forced legally to enter into industrial symbiosis or act according to the stakeholder engagement principles but they both together with CSR share the same responsibilities according to the informants as well as earlier conducted literature review.

The first sub question aimed to find an answer to the question considering the relation between CSR and Industrial Symbiosis through stakeholder engagement. All the participants in the interview recognized that there exist the similarities and the genuine interest of thinking about others from the business perspectives combined these two aspects together. These two models have the power the empower one another; both of these models are working in collaboration with other actors in order to bring the financial as well as environmental benefits within the sphere that they are operating in.

The second question of the interview aimed to see how these two concepts correlate with each other through stakeholder engagement as the literature review gave an understanding that they share many similarities but has not been studied together as such. This is not to

say that one does not exist without the other, but in the developing of industrial symbioses they can both greatly benefit from their ideologies and concepts behind. The table above proves the connection and similarities with these concepts and some of the examples that the interviewees provided are encouraging.

"Both IS and CSR are strategical choices. Company's chooses a certain strategy that the company will follow in the long run. When stakeholders understand why things are done as they are, the will act according the model that the company sets."(B1)

"Both share wider perspective in matters. It comes down to genuinely thinking about others and it could be said that empowerment of others" (G1)

"Industrial symbiosis operates inside the CSR concept that as an idea generates new business opportunities. IS also clarifies what CSR is all about with its clear goals." (O1)

5.2 KEY FINDINGS OF THE CASES

This part will build a coherent picture of three different areas that were covered in the interviews. The previous chapters built a foundation to see how CSR, stakeholder engagement and IS correlate with each other. These latter chapters will present key finding concerning the incentives that why companies should pursue a role in IS, the second part will cover management viewpoint to industrial symbioses with stakeholder engagement and the last part will bring clarification about strategical implementation of industrial symbioses with stakeholder engagement. The forth and the last part will aim to draw a conclusion of the main research question through the chapters that have been covered with a help of the interview questions.

5.2.1 Incentives to enter into industrial symbiosis

In the earlier study from the literature there were many incentives of why companies could benefit from the nature of industrial symbiosis. Sub question two aimed to answer the question that what are the incentives to enter into industrial symbiosis.

During the interviews all the participants found more than one reason to develop industrial symbioses and could see the holistic nature of these kinds of processes for the environment, society and to the company itself.

The table 7 is presented to show different approaches when interviewees answered the question that what are the most important reasons for company to go after a partnership in industrial symbiosis

Table 7 “Reasons to enter into industrial symbiosis”

	A1	B1	G1	D1	O1
Resource savings/Financial benefits	x	x	x	x	x
Environmental responsibilities	x	x	x	x	x
Image and brand aspect	x			x	x
Competitive Advantage			x		x
New business opportunities		x		x	
To have a future where we would still have resources			x		
Building trust and honest business culture – increasing of transparency		x			

As the table 7 shows all the participants mentioned resource savings and environmental aspect as incentives to enter into industrial symbiosis. New business opportunities were mentioned by two and competitive advantage also by two. All the participants mentioned at least three reasons why entering into IS is important. Both A1 and G1 mentioned financial aspects through the resource savings and raised an example of waste management costs in Finland that are an expensive cost for the company. It costs to toss the garbage in the landfill and the tax price for one thousand kilograms is 70 euros. This alone is already a big incentive for companies to reconsider their use of resources.

"If we are not working for the future we will not have a future. We cannot live in a culture where we consume the nature's resources as we have done before. We cannot take the virgin resources (because soon we do not have them), use them and toss them away. We must start bending the business models according to the circular economy, where industrial symbioses are a part of."(G1)

"Resource savings, new business opportunities from the recycling of the material and how it can be produced to new products are incentives to enter into IS. It is about making sure that the critical materials that are lessening already from our nature stay in the circle as long as possible. That is already one of the reasons in certain industries and it is not anymore as something that they could do but something they have to do. Also image and reputation can be as a guiding factor for the companies to enter into industrial symbiosis" (D1)

As the interviewees has pointed out the variety of reasons why enter into these symbiosis it is vital to note, that even though economic and environmental reasons works as an important motivation to enter into these networks, there exist also, regulatory aspects that are one of the key reasons when companies get involved in the IS. A good example is offered when "in Europe, the Resource Efficiency Flagship Initiative and the subsequent Roadmap for a Resource Efficient Europe have recommended that opportunities to exploit resource efficiency gains through industrial symbiosis should be a priority for members in the European Union". (Corder, et al., 2014) This provides perspective to see one of the important incentives of why companies are entering into sustainable networks with each

other. It indicates that there are the internal and external reasons that affect the choices of the organizations in the pursuit of sustainability. (Chertow, 2007)

5.2.2. Management viewpoint to industrial symbioses with stakeholder engagement

Interviewees were asked four different questions considering different management related questions such as what do they consider to be the biggest challenges concerning industrial symbiosis from the management viewpoint. These questions aim to cover the perspective on social issues affecting industrial symbiosis from the management perspective.

The third sub question wanted to highlight the social aspects important in every industry management procedures. The question asked that what is the importance of social aspects is in industrial symbiosis from the management viewpoint. These four questions created for the interview aimed to bring a wider understanding of the matter by raising the challenges that appear when working in this kind of an environment. Also, the fact was covered of participants' consideration about the fact that how much of the existing symbioses have strategic planning in them and how many of these symbiosis have spontaneously developed.

All the participants mentioned that trust is the key aspect in order for the symbiosis to succeed. There were also notion from the different regional aspect that for example in Finland people trust each other from the start and this is not always the case in the other locations where the trust need to be earned. (G1). This means that for example Finland can possess better starting conditions in developing industrial symbiosis (G1) but as B1 mentioned even though trust is a big and important thing but also the other factors such as the transparency and courage of companies to do new business together is significant.

G1 highlighted the matter of management and their time division. Most of managers' time is spent in these so called soft communications that aim to build trust between different stakeholders. It is as A1 formulated it:

“Trust is a vital part for these symbioses to succeed. To be able to trust means that the company itself can also go all in with the partnership. Key aspects for making symbiosis to work is building and developing the trust.” (A1)
A1 continues from the social aspects and communication mentioning:

“Communication is very important. Finding the right partners for the business actions and being able to communicate because of the many different actors operating in industrial symbiosis is vital. This means that the management has to be a prepared with certain set of skills in order to properly communicate the business attention to others.”(A1)

B1 offered from the communication an example where they have conducted a business with company that used to give the by-products to the animal food business. The company’s management made a strategic decision to change their old way of doing handling byproduct into a new ones and offered the waste to the biofuels industry. This meant that the regulations that govern the animal food business could be avoided when the product was given to the biofuels industry which after its own operations could then circle it back to the animal food industry. Hence there product still went to the animal food business but a new step was built in between these two actors and this made the industrial symbiosis widen and created new business opportunities as well as increased the amount of stakeholders.. The company’s management was responsible to communicate the message to the others and sell the idea to other stakeholders.

“Communication is important and making people understand why something is done. To successfully communicate that why is the change done so that the employees and others will understand the new model. This means that the management must understand and being able to communicate the message to others so that the new model of doing business will gain support.” (B1)

These aspects of trust and social connections were considered to be important by all the participants.

A question was presented for the participants, that what they consider how much they evaluate of the existing symbioses having strategic planning in them or how many of these

symbiosis have spontaneously developed. All the participants said that most of the symbioses have developed through strategic planning that even though these have always existed, nowadays they are pursuit with more strategic resilience. Only G1 evaluated with a number reaching to about 80% (G1) of IS including strategical implementation when others stated that the number is very big and must formulate a majority of the developed industrial symbioses.

In the same part of the interview there was also asked about the challenges that companies encounter when corporations aims to be part of the industrial symbiosis. Challenges concerning industrial symbiosis from the management viewpoint varied, but all the informants recognized their existence. All the participants agreed that finding the win-win situation for all the partners is one of the challenges. Table 8 presents encounters that the empirical findings comprised of.

Table 8 “Biggest challenges concerning industrial symbiosis”

	A1	B1	G1	D1	O1
Finding the win-win situation for everyone	x	x	x	x	x
Transparency			x		
Enduring of uncertainty			x		
Openness		x	x	x	
Building Trust			x		
Creating genuine dialogue between stakeholders through interaction with each other			x		
Sharing of information				x	x
Not being able to	x			x	

recognize the right stakeholders					
Lack of time				x	
Recognizing the benefits		x			
Having courage to do new things		x			
Resource risks		x			
Management's attitude	x	x			**x**

As the table 8 demonstrates, the scale of different challenges varied between the participants' answers but all mentioned that there existed a challenge in creating the win-win situation to everyone.

"It must be the recognition of the right partners. To understand who are relevant for company's own business operations. Also finding the right people to function in the development and management of industrial symbiosis and also finding the right and honest partners. Trying to get the agreement that brings the win-win, winwinwin situation to all."(A1)

5.2.3 Strategical implementation of stakeholder engagement in industrial symbioses

This part will lay foundation to understanding of what are the actual tools to understanding of how to implement stakeholder engagement in real life in the development in industrial symbioses. This part answers the last two questions that were presented in order to reflect the managerial contributions and benefits to the matter.

The question aimed to understand how in the actual business life management can recognize the important stakeholders in industrial symbioses. Many interviewees brought their opinion on the matter, that the outside facilitator is an important aspect in bringing companies together. This facilitator works as a match maker that bring companies organized so that they can see what are the prospect business opportunities with certain companies.

B1 stressed the importance of how management should listen to their employees because they are the ones working on the field and they have the in-tacit and tacit knowledge of what opportunities may lay between different partners such as suppliers, other companies or with customers.

O1 talked about the importance of the managers to constantly network and think outside the box to find new business occasions that the company could benefit. O1 also found the outsider to work as a facilitator important because outsider can bring together those possible win-win situations for companies.

These outsiders who work as a facilitator can exist in the forms of different workshops, seminars or meetings arranged by someone specialized in the organizing of industrial symbioses. Here are some examples along with the facilitators that were raised as a helpful tool to recognize the right stakeholders for the development of industrial symbiosis:

- Workshops
- Seminars
- Listening to company's own employees
- Making physical visits to other companies factories to see if there would exist chances for a future collaboration
- Networking
- The help from the outside where someone works as a facilitator
- Different innovation tournament
- Increasing the dialogue between different stakeholder
- Law & regulation

- Making sure you are sure who are your key stakeholders and expanding your networks from there

The answers showed versatile approach in the finding of the right stakeholders and D1 summarized own answer to include three points which were

"Companies need to network, use outsider as a facilitator and receive help from the outside"

The last question followed the same guidelines as the previous one but instead of studying how can companies' recognize the important stakeholders, the last question the aimed to study that what are the new viewpoints that will be opened by the stakeholder engagement and what kind of tools it will bring to the management in industrial symbiosis.

O1 emphasized the company's new ability to recognize what company needs and what might be the future possibilities for the company itself. B1 talked about the increasing communication and ideas that management can benefit in their everyday actions when following and implementing novel strategical choices. G1 raised the valued point about how gaining new networks will give the chance to minimize risks when company engages itself in this kind of collaboration.

Here are the main points raised by the participants about the new viewpoints management gains through stakeholder engagement in industrial symbiosis.

- New networks
- Diversity
- New ideas
- Risk-minimizing when moving from homogeneity to heterogeneity networking. Collaborating between different industries make companies more flexible and easier to respond to challenges that affect companies' operations
- Advantage of anticipation the business markets

- By sharing the success stories of IS companies can implement those certain actions in their own operations

The empirical findings suggest that companies have many possible ways to benefit and gain new tools from the stakeholder engagement in their daily operations concerning industrial symbioses.

"Companies will gain new potential partners through seminars and outsider matching these companies. When sharing of the success stories of IS, it will motivate others to work also. When people know that how did it start and how the system was developed it gives concrete guidelines for companies to follow"(D1)

5.3 Contribution of the empirical part

The empirical findings and literature review accompanied each other and many same aspects could be found from the importance of stakeholders operating as a driver for the development of industrial symbioses. Trust was highlighted as the most important aspect when developing IS and external help was emphasized when there was a need to recognize the key stakeholders. This matching seemed to be easier when there was a neutral actor between companies matching them and aiding in the search of beneficial situation for all the parties involved.

The need for novel business models was covered throughout the interview and interview participants felt strongly about the vast potential of industrial symbioses and their opportunities. Interesting point of the research was to discover that there exist a need for companies to hear about the success stories of other symbioses and how they have developed and how did they find the right partners, which were the steps that needed to be taken and how much financial profits were generated and what new business ideas have generated from the collaboration of the symbiosis.

The empirical part emphasized the potential of these symbioses but participants could also highlight the many challenges that exist in the developing of them. Finding the right partners, developing trust, investing in the new networks and being able to take chances

with new ways of conducting business were mentioned being challenges. Management attitude was mentioned being important aspect in the development of IS and how transparent their actions are. The overall research findings suggest that engaging stakeholders in the development of industrial symbioses is vital and it brings many benefits from resource efficiency to new business opportunities and environmental friendly actions, but IS are also hard to develop because of the many challenges that there exist in the contemporary business thinking and approaches.

6. DISCUSSION AND CONCLUSIONS

This chapter combines the conclusions from interviews and secondary data that were studied in the previous part. These two parts are reflected against one another to see what similarities they share and what was contradictory. In addition to this, theoretical and managerial contributions are discussed. To conclude, this final chapter discusses the limitations of the study along with recommendations for future research.

As it was stated in the chapter before that the whole analysis will aim to answer the main research question with the help of the sub-questions. Sub-questions and the main research questions were

Sub question 1: How does stakeholder engagement correlate with CSR and Industrial Symbiosis?

Sub question 2: What are the incentives to enter into industrial symbiosis?

Sub question 3: What social characteristics influence the development of industrial symbiosis?

Sub question 4: How companies can benefit from stakeholder engagement as a strategical approach in the development of Industrial Symbioses?

The main research question: How CSR and stakeholder engagement encourages the development of Industrial symbiosis from the management viewpoint?

These questions have built the foundation for the whole study and throughout the empirical part they have been answered with the analysis of the informants' answers.

6.1Summary of the main findings

CSR and its stakeholder engagement perspective, is offering a novel approach to study industrial symbiosis in management purposes and its potential as company's competitive advantage. As it has been stated earlier in the chapters the importance of the social aspects

that builds the solid foundation for the actions for the management, CSR and IS both are the by-products of these social connections. In order to achieve sustainable society industrial activities must be integrated in it socially, economic and environmentally. Management of Industrial symbiosis can get guidance and inspiration from CSR and this way produce more sustainable actions that lead to sustainable development and ample business profits.

According to interviews, it can be said that proactive stakeholder engagement is one of the key issues why industrial symbiosis develop. When an outsider works as a facilitator of these symbioses, the stakeholder engagement is bigger and can produce more results – financially and environmentally. The companies that are working in these clusters probably are not always aware of all the opportunities hence it is important that there will be an active touch from the management viewpoint in creating these opportunities by linking different actors together. Networking, transparency, consulting with employees or getting an external help with the matching of these symbiosis are one way to engage stakeholders and finding novel business opportunities and sustainable business goals. Most of the time these outsiders that work as a facilitator are only needed in the beginning and the companies are able to build relationship themselves if they feel that will be a mutual beneficial relationship available.

Many of the interviewees considered that finding the right stakeholders were problematic which correlates with the current literature. In the analysis part there were given different approaches of finding the right stakeholders that were not mentioned in the academic literature part in such a detailed manner.

B1 stated about finding the right stakeholders that it is important to take into consideration what the employees have to say as it occurs that the productive ideas emerge from the people who are working everyday on the ground level and seeing the missing links that are needed or possible new innovative partnership that could lead to the win-win situation of the companies. Part of the interview participants raised the matter of vertical management style during the interview and their importance and mentioned the importance of engaging the whole company in the development of industrial symbiosis. It was completed that the ideas and management would follow from top-down to bottom-down and the transparency

of the management decisions would be covered. It was considered important to tell stakeholders that why things are done as they are and what will become of this new contract or new way of doing business.

Overall the theoretical part as well as empirical find the correlation of CSR, stakeholder engagement and Industrial symbiosis to exist and that it is possible for the development of industrial symbiosis to benefit from the concepts of CSR and especially stakeholder engagement operating as a bridge between. As it was stated by the interviewee "stakeholder engagement is the very foundation for the symbioses to succeed".(G1)

Relation between CSR and Industrial Symbiosis through stakeholder engagement

Both the theoretical and empirical part established that there exist similarities between the concepts of CSR and IS. There exist the same responsibilities in CSR as well as in the implementation of IS. Importance of stakeholders was recognized among the informants. The empirical findings suggest that stakeholders form an important part in both concepts and the social relations are the key to successfully go from the theoretical implications of CSR to actual development of IS.

Case companies were not given any distinct definition of the concepts; however all the participants listed the same responsibilities. In the literature review and during the analysis, the importance of financial gains were highlighted that even if the company would not operate solely in the pursuance of economic gains, these economic benefits must be guaranteed for the company to operate in the market so that it can provide a holistic approach to the CSR itself. (Steurer, et al., 2005) This is one of the important correlation between CSR and IS because the solutions made in IS produced these financial gains through different resource savings and new business ideas.

However, even if there does not exist a coherent definition of these concepts under the study, their responsibilities are well acknowledged. The studies implicate that all the companies engaging in CSR or IS activities are going beyond the legal aspect. Case companies and theoretical review stress the discretionary responsibilities of these concepts where companies' actions are about taking a proactive attitude and minimizing the

environmental harms through the stakeholder engagement in the development of industrial symbiosis.

Incentives to enter into industrial symbiosis

Case companies could list various reasons why it is important for companies to enter into industrial symbioses. From the productive business ventures to the only options in order to respond to the challenges of the future, interview participants' answer's and theoretical contributions aligned. Kapur and Graedel, (2004) have stated different reasons why industrial symbioses are beneficial for companies. The reasons varied from the economic benefits that included reduced waste management as well as by-product exchange. Other financial gains were buying the merchandises below market price, reduced organization costs and enhanced process efficiency. The environmental benefits can contain the following:

- Reductions in greenhouse gas emissions and other pollution
- Improved energy; material and energy efficiency
- The promotion of pollution prevention and recycling programs.

Another thing that Kapur and Graedel (2004) emphasized were the benefits of co-operative ventures like joint purchasing through risk minimizing i.e. in disaster response. This aspect of risk minimizing was also accentuated in the empirical part of this study.

In the end, as it was stated throughout this study, industrial symbiosis and novel business models aiming to sustainability will come down to the fact that there are natural limits to growth and the modern business world is in need to considered and understand the development of novel industrial processes that target doing business in a sustainable way and formulate the business according to the paradigm of cyclical thinking. (Pluijm, et al., 2010, p.204)

Social characteristics influence in the development of industrial symbiosis

Social relations in CSR and IS are vital in order for these concepts to function. Trust, transparency, communication and stakeholder engagement through the management decision have been emphasized throughout the study. The empirical findings confirm the importance of these aspects that have been presented in the literature review. Majority of the research questions were derived from the basis of literature review which included some characteristic of the social perspective such as trust, communication and recognition of the right stakeholder.

From social characteristic the communication between different stakeholders was considered very important. Also, the empirical findings suggest that finding the right partners for the business actions and being able to interact with them is vital for the development of industrial symbiosis.

Social characteristics play an important role in the development of the industrial symbioses. This means, that the management has to be a prepared with certain set of skills in order to properly communicate the business attention to stakeholders.

Stakeholder engagement as a strategical approach in the development of Industrial Symbioses

It was stated in the theoretical part by Behera, et.al. (2012) that in order for these symbioses to succeed there needs to exist a requirement for the creation of a dynamic management around it. Management is about dealing with social and conscious aspects of the company (Kofman, 2006). This part was considered very important by the theoretical part as well as empirical, because of the fact that stakeholder engagement and industrial symbiosis is about the interaction of different social beings inside the business concept.

From the empirical findings it could be concluded the importance of management is taking risks and implementing a new way of thinking and also the notion of "soft communication" that takes the majority of time of the managers' day. The challenges that the development of industrial symbiosis face are the fear or not implementing new ways and not taking in consideration the long-term time view. Management needs courage and transparency in

their decision and a collective approach where the stakeholders are engaged from the employees to suppliers.

This study's empirical findings were lined up with the theoretical findings where trust was considered to be one of the key values in order for these symbioses to succeed. Trust between stakeholders were given a great importance and one relevant comment among others during the interviews were the culture related attributes such that in Finland trust is developed usually immediately when the interaction takes place, whereas somewhere else there is a need to mature trust between participant longer. This does not mean that trust could not be lost as easily in Finland as in anywhere else, but it can mean that there exist geographical attributes that favor the development of these industrial symbioses.

The very core idea of stakeholder engagement is to add value for every actor in the company's environment. (Heinonen, 2014; Freeman et. al., 2010, p.4) and this same idea can be applied according to the interview results to industrial symbiosis where the aim is to find the win-win situation for everybody. The literature review and analysis of this study stated that companies face problems when they do not reach the right stakeholders. Therefore companies should try to engage themselves with the rightly chosen stakeholders but this is easier said than done. Due to this reason the analysis part gave instructions of how companies might gain new potential partners through seminars and external professionals matching these companies with each other.

Many companies have made CSR as a central division of strategic management. (McWilliams, 2015). One of the key aspects that have shed light to the academic literature considering CSR and stakeholder engagement is that, interaction with company's social relations is in its core part, but there are also voices against it that points out the diversity of stakeholder engagement in its many forms. (Greenwood, 2007) One point that was discovered in the analysis was that when companies and others start sharing the success stories of IS, it will motivate others to develop these clusters also. When people know that how did it start and how the system was developed it gives concrete guidelines for companies to follow.

6.2 Theoretical and managerial contribution

As it was stated earlier in this research "according to the studies conducted in CSR the lacks of resources and top management commitment have been identified as the biggest barrier for successful implementation of CSR". (Werther & Chandler, 2006)

Due to this recurring aspect, it was stated in the very beginning of this study that this research will aim to bring managerial contribution to the matter. But from the scientific purposes and theoretical influences this study aimed to show the importance of two study field and how they linked together - CSR and industrial symbiosis. Throughout the research there has been the aim to show how these two correlate with each other and how could it benefit the development of industrial symbiosis especially from the stakeholder engagement point of view.

As CSR itself provides guidelines and responsibilities what socially responsible actions should include, it does not provide a detailed picture of how companies could implement those social, economic and environmental responsibilities. Industrial symbiosis works as a good platform to implement CSR strategies because it has already defined those models of how it is possible to work more environmentally responsible way but at the same time gain economic benefits. Working in industrial symbiosis it is possible to make resource savings as well as have the chance to produce new financially lucrative business models and these CSR strategies are actually implemented in the core actions of the company. There exist four CSR principles in order to build a socially responsible strategy (Werther & Chandler, 2006)

1. CSR perspective
2. Core operations
3. Stakeholder Perspective
4. Over the medium to long term

The four guidelines are also covered in the informants' answers when there were discussions of how do CSR and IS correlate. This means that managers can benefit from the earlier conducted studies on CSR in order to develop and find the right stakeholders in

their symbioses. The empirical part of the study emphasized receiving the external help in order to recognize new stakeholders and develop industrial symbioses. These facts were found through the analysis itself and were not covered in a great extent in the theoretical part.

This research will hopefully be beneficial for managers in order to start developing the idea of industrial symbiosis from the stakeholder viewpoint. Also the importance of connecting previous studies of stakeholder engagement and how they might encourage industrial symbiosis is an aspect that management should recognize in their everyday actions.

6.3 Limitations and future studies

Limitation concerning this study is that the sampling of the case companies was made by the theoretical means and not with the statistical sampling. The cases selected for this study were all part of industrial symbiosis either through their company's operations or by the role of an expert. Case companies were operating in different industry hence for the future study purposes it would be interesting to see that how do the industry correlate with the study field of CSR and stakeholder engagement. Another interesting topic would be to study how sharing of the success stories of industrial symbiosis would affect their development.

Also due to the fact that the sampling was made from the companies operating in Finland and the interview results that suggested the culture related response in the development of industrial symbioses, these culture characteristics could work as a study field for the forthcoming researches.

This study does not cover all the aspects of CSR, stakeholder engagement nor industrial symbiosis. This study aims to study the topics through the case companies and what are their perceptions on the matter. There exists also a possibility that informants could provide inaccurate data. Moreover, although it was mentioned that the data provided by the informants can be considered fairly reliable in the cases when several interviewees referred to the same fact or gave similar answers – it needs to be taken into consideration that the selection of case companies stayed relatively small. It is because of this, that limitation

rises from the limited number of informants. Future studies could apply the framework created for the study in order to research a larger sample cases.

Also the fact remains, that the academic literature has not found a consistency for the terms of CSR and Industrial symbiosis. This thesis did not give one specific meaning to any of the concepts but organized different assumptions made from the subject in both parts- theoretical and empirical - of the study. This thesis either did not concentrate on one set of stakeholders hence for the future studies it might provide some new insights to the matter if the research is conducted solely on a certain group of stakeholders.

In order to get a holistic picture of how the stakeholder engagement encourages the development of industrial symbiosis it would be interesting to use the data collection technique where it would be studied in a situation where there would be the addition of information composed from the stakeholders.

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Appendixes

Interview questions

Introduction to the CSR management with stakeholder engagement and industrial symbioses

1. Are you familiar with the concept of CSR management and how would you define it? How about stakeholder engagement?
2. Are you familiar with industrial symbiosis and how would you define it?
3. What similarities can you find from CSR management and industrial symbiosis from the management viewpoint?
4. What are the most important reasons for company to go after partnership in industrial symbiosis?

Management viewpoint to industrial symbioses

5. How would you evaluate the importance of trust from the viewpoint of management so that industrial symbiosis will succeed
6. How important are social aspects (communication with stakeholders) in the management of industrial symbiosis? Can you think of other factors that are important for the success of industrial symbiosis?
7. What do you evaluate that how much of the existing symbioses have strategic planning in them and how many of these symbiosis have spontaneously developed?
8. What are the biggest challenges concerning industrial symbiosis from the management viewpoint?

Strategical implementation of industrial symbioses with stakeholder engagement

9. How can companies' management recognize the important stakeholders in industrial symbioses and also, finding new industrial symbioses?
10. What kind of new viewpoints will be opened by the stakeholder engagement and what kind of tools it will bring to the management in industrial symbiosis?