Spreading Sustainability Initiatives across Supply Networks: a Case Study of the Bio-Chemical Industry

(Competitive Paper)

Osama Meqdadi (omeqdadi@audencia.com)

Thomas Johnsen (tjohnsen@audencia.com)

Rhona Johnsen (rjohnsen@audencia.com)

Audencia Nantes School of Management, Nantes – France

ABSTRACT

Based on an in-depth case study, this paper investigates the development and spread of a sustainability initiative across the supply network of a chemical company. The focal company and its second tier supplier have adopted a proactive stance toward sustainability and entered into a partnership to develop a bio-based chemical product. The sustainability initiative has resulted in the development of a business model that involves actors at several tiers within the supply network.

The IMP Interaction Approach has been used as a lens to analyze how the sustainability initiative propagates in the supply network. The paper further examines the role of customer-supplier relationship characteristics in fostering or hindering the involvement of suppliers in the sustainability initiative and in filtering sustainability requirements further upstream in the supply network.

The findings suggest that relationships characterized by trust and cooperation, rather than those focused on the use of power would bring about more effective results in implementing and spreading sustainability initiatives within supply networks. The paper makes several contributions. First, it contributes to the existing sustainable supply chain management literature by adopting an IMP interaction approach that reveals insights on how sustainability spreads within a supply network. Unlike the majority of studies to date, the case study findings builds on data collection from multiple network actors and thereby provide insights from multiple actors and their perceptions of a sustainability initiative being implemented by another network actor. Secondly, surprisingly few IMP studies have focused on sustainability; this paper contributes to IMP research by providing a better understanding of how sustainability initiatives can be implemented in supply networks.

Keywords: Supply Network, Sustainability, Spread, Bio-Based, Customer-supplier Relationship Characteristics

INTRODUCTION

Companies' accountability for sustainability has been extended beyond their traditional boundaries to include the impact of their supply networks on sustainability (Kovacs, 2008). This necessitates that actors in the supply network coordinate their efforts to improve sustainability which cannot be attained individually. The definition of sustainable supply chain management (SSCM) provided by Carter and Rogers (2008) as "*the strategic, transparent integration and achievement of an organization's social, environmental and economic goals in the systemic coordination of key inter-organizational business processes for improving the long-term economic performance of the individual and its supply chain*", stresses the importance of coordinating and organizing the activities between the actors in the supply network to achieve sustainability. Similarly, other authors who provided definitions on SSCM (Hassini et al., 2012; Seuring and Muller, 2008) or other concepts related to sustainability, such as reverse logistics (Rogers and Tibben-Limbke, 2001), green purchasing (Zsidisin and Siferd, 2001) and green supply chain management (Sarkis et al., 2011; Srivastava, 2007), also highlighted the importance of engagement of actors in the supply chain for implementing such concepts.

Several studies have reported on the strategies that companies adopt for engaging suppliers in their sustainability initiatives such as a monitoring strategy, which is based on assessing suppliers sustainability performance through some kinds of audits and questionnaire (Blowfield, 2000; Vachon and Klassen, 2006) and a mentoring strategy that depends on close interaction and collaboration between the actors to improve sustainability (Hines and Johns, 2001; Vachon and Klassen, 2006). However, existing research has not addressed how companies' strategies and programs designed to improve sustainability are extended across the supply network by involving not only direct suppliers of the focal company, but also other actors located at different levels in the supply network. In addition, there is a need to understand the role of business relationships in implementing sustainability in the supply network (Hoejmose et al., 2012).

Theories such as stakeholder and institutional theories are insufficient to provide a holistic view on how sustainability goes beyond the first tier of suppliers in the supply network. The Industrial Marketing and Purchasing (IMP) Group and Interaction Approach with core concepts of connectedness and embeddednes of actors can be very useful to study how sustainability propagates in the supply network. Sustainability within IMP is an under-researched topic. There have been several attempts to understand how sustainability spreads in the supply network and the effect that sustainability induces in the network (Harilainen, 2009; Ritvala and Salmi, 2010). However, more empirical work is needed to understand how actors such as suppliers are engaged in companies' sustainability activities (Tate et al., 2013), how sustainability can be executed in the supply network and how customer-supplier relationship characteristics can be utilized to facilitate the implementation of sustainability initiatives between several actors.

This paper investigates a chemical company's attempts to 'green' its supply network through developing bio-based products. This has led the company to develop a partnership with its second tier supplier and to engage in cooperation with other suppliers in the network to implement the sustainability initiative. Customer-supplier relationship characteristics (Johnsen et al., 2008; Johnsen and Ford, 2008) such as power, trust and cooperation have been investigated to determine their effects on implementing the sustainability initiative at different levels in the supply network.

In this paper, two research questions are posed:

1- How does sustainability spread in the supply network?
2- What is the role of customer-supplier relationship characteristics in implementing sustainability across the supply network?

The paper is structured as follows. The first section is concerned with providing a literature review on sustainability from an IMP perspective and on the role of customer-supplier relationship characteristics in implementing sustainability. The second section reports on the research methodology used and how data has been collected and analyzed. The third section introduces the case study and the development of the sustainability initiative across the supply network. This is followed by the analysis and answers to the two research questions. Finally the paper provides a concluding discussion, managerial implications and identifies avenue for future research.

LITERATURE REVIEW

Sustainability has been researched extensively in supply chain management. A major portion of existing studies focus on individual companies or include direct suppliers of the focal company (Miemczyk et al., 2012; Seuring and Gold, 2013). Several authors have emphasized the need to move from single firm or dyadic relationship perspectives to adopt a network perspective by considering sustainability at multiple levels in the supply network (Leek, 2012; Nogueira et al., 2010). Seuring and Gold (2013) stressed the importance of meeting sustainability challenges through joint efforts of the actors and adopting a system perspective. As indicated by Ritvala and Salmi (2010) "*actions of single actors are ineffective if they are not acted upon by other actors*". The single firm and dyadic relationship views preclude the assessment of the direct and indirect impacts of sustainability strategies and programs in the supply network. This may lead to undesired effects or unsuccessful implementation of sustainability initiatives (Öberg et al., 2012). As this paper adopts a network perspective, the following two sections will discuss the spread of sustainability in the supply network and the effect of customer-supplier relationship characteristics on its implementation.

Sustainability Spread in The Supply Network

The IMP Interaction approach is a useful lens through which to examine how sustainability can be implemented beyond an individual company's borders. The IMP approach views companies as embedded in a network context built on established actor bonds, resource ties and activity links (Håkansson and Snehota, 1995). Embeddedness implies that a change induced by a focal company may affect not only the direct actors who have business relationships with the focal company but also indirect actors in the supply network. Consequently, change could happen at different levels such as within the company, at the dyadic level within a single relationship or in the business network creating wider effects on its structure and relationships (Dahlin et al., 2005).

The effect of change in business networks and relationships is aggravated by the degree of interconnectedness and interdependency between actors. A change in a single relationship may propagate to other parts in the network and affect not only those involved in the single

relationship but also other actors connected to that relationship (Hertz, 1998; Waluszewski et al., 2009). Change triggers actions and reactions from the actors in the network as it represents an opportunity for some actors and a threat to the others. Accordingly, the actors' perception of the change determines their situation as promoters or resistors of the change. The outcomes of a change initiated by an actor are dependent on the actions and reactions of the actors in the network and their approval of the change (Håkansson and Ford, 2002; Håkansson and Snehota, 1995).

The change magnitude could be radical or incremental (Havila and Salmi, 2000; Håkansson and Snehota, 1995). When the change is radical it means it causes severe turbulence in the network, while incremental change implies that business relationships remain almost stable (Dahlin and Havila, 2008). The change can be classified as confined when it occurs in a single relationship or connected when it has effects in the network (Halinen et al., 1999). Harrison and Easton (2005) argue that the most preferable change for firms is the continuous one; minor in magnitude and which can be dealt with internally. The least preferred change is a discontinuous one that is external to the firms and has a large magnitude (*ibid*.). In such a case, managing the change is difficult especially when it is associated with disruption to the firms' processes and routines.

Change can be transmitted and spread more easily in the network when the connectivity between actors is high and vice versa (Dahlin and Havila, 2008; Harilainen, 2009). Tate et al., (2013) studied the diffusion of environmental business practices (EBP) in supply networks and they argue that high structural and relationships embeddedness can lead to better diffusion of EBP across the supply network.

Sustainability as it induces change has to be considered at the network level. Studying sustainability from a single firm or dyadic relationship perspective may provide a distorted or incomplete view on how to implement sustainability initiatives successfully. As actors are embedded in business relationships, the effect of sustainability and actors' responses towards sustainability could lead to different results than expected when only single firm or dyadic relationship perspectives are considered. Öberg et al, (2012) studied the decisions of three companies on reducing the environmental impacts of their operations. They demonstrated that adopting a network level for the assessment of the impacts of the decisions on the environment led to totally different results than when a single firm view (the focal company) was adopted. The network perspective enables the indirect effects of the decisions to be captured.

Role of Business Relationship Characteristics in Sustainability Implementation

Early frameworks in IMP literature, such as the interaction model, focused on dyadic relationships. Subsequent research has built in the interaction approach to consider relationships and their connections at a network level. A relationship is defined as "*two actors become mutually oriented and identified in relation to each other*" (Håkansson and Snehota, 1995. p. 197). A relationship between two parties is not developed in isolation but is regarded as part of other interdependent relationships. So, a relationship is embedded and connected to other relationships. The connectedness of relationships implies that what happens in a relationship has repercussion on other relationships and vice versa (Håkansson and Prenkert, 2004. p. 87).

Customer-supplier relationship characteristics or atmosphere, which are part of the interaction model (Håkansson, 1982), can be used to understand the effect of relationships on the

implementation of sustainability in the supply network. Coupling sustainability with customer-supplier relationships is neither straightforward nor a seamless process. Traditionally business relationships are sought by companies to achieve strategic objectives and operational excellence. When companies try to engage suppliers in their sustainability activities they add a new dimension that has to be tackled by the business relationships (Canning and Hanmer-Lloyd, 2001). Customer-supplier relationship can be utilized to act as a mediating factor for improving the behavior and involvement of suppliers in the sustainability.

Customer-supplier relationship characteristics have been studied by several IMP researchers (Gadde and Håkansson, 2001; Hadjikhani and Thilenius, 2009; Johnsen et al. 2008; Johnsen and Ford, 2008). In this research the focus has been on three characteristics: power, trust, and cooperation. There is a contrast in the literature findings on the role of power, trust and cooperation in implementing sustainability in the supply network. Some studies favor the use of power where the company can coercively enforce its suppliers to respond to its requirements (Vachon, 2007). Other studies emphasize the importance of interaction between the company and suppliers where the trust and cooperation are essential elements for the sustainability implementation (Simpson and Power, 2005; Vachon and Klassen, 2006).

Power

Power means the ability of one actor to influence the behavior or actions of another actor. It can be defined as the "*ability to evoke a change in another's behavior*" (Huang and Wilkinson, 2006). Power and dependence have been investigated extensively by IMP researchers and it is an important dimension to be considered in strategic supply relationships (Johnsen et al. 2008) and in asymmetrical business relationships (Johnsen and Ford, 2008).

Institutional theory is concerned with the external pressure on companies to adopt certain practices or behavior. This theory has been used frequently for studying how companies adopt sustainability practices in response to the external pressure (Kotzab et al., 2009; Sarkis et al., 2011). The company can use its power, due to its size and position in the supply network, to make improvement in the sustainability (Zhu et al., 2008; Zsidisin and Siferd, 2001). Other researchers reported on the drawbacks of using power in implementing sustainability in the supply network. The use of coercive power to influence other actors in the network to implement sustainability may result in a "passivity" behavior and reducing the cooperation in the network (Fadeeva, 2004). It can be concluded that utilizing only the power dimension to improve sustainability in the supply network is not enough and it has to be coupled with other business relationship characteristics.

Trust

Trust exists in relationships when an actor can rely on another actor to act in an expected way. It can be defined as "*a party's belief in the reliability of an exchange partner and its readiness to behave accordingly*" (Huang and Wilkinson, 2006). As indicated by numerous studies trust is essential to reduce the opportunistic behavior and increase the knowledge sharing between the actors in the supply network (Spekman and Carraway, 2006). Trust also acts as a risk minimizer especially when there are investments to be made by the actors (Sako and Helper, 1998).

The business relationships and partnerships that are characterized by high levels of trust would provide a competitive advantage that is difficult to imitate (Beske, 2012; Gold et al., 2010). This has been emphasized by several studies on role of trust in sustainability implementation. Vachon and Klassen (2006) indicate that existence of high level of trust between the company and suppliers for implementing the sustainability may reduce the need for monitoring activities which can allow the company to focus its resources on other areas. Likewise, Geffen and Rothenberg (2000) indicated that high level of trust between the company and suppliers is needed to achieve environmental performance improvement and share of knowledge and innovation.

Cooperation

Cooperation can be defined as the extent of working together towards a shared aim or direction for the relationship (Ford et al., 2003). It is an important characteristic and gives the business relationships the strategic feature (Johnsen et al. 2008).

Cooperation between actors is necessary to achieve positive sustainability results and it is at the core of implementing the sustainability strategies (Bowen et al. 2002; Vachon, 2007; Vachon and Klassen, 2006; van Bommel, 2011). Seuring and Muller (2008) emphasized the importance of extending the cooperation beyond the first tier suppliers to include suppliers in other tiers. Actually a distinguishing element in some sustainability strategies such as the monitoring and mentoring strategies (Vachon and Klassen, 2006) is the level of cooperation between the actors. Hence, a main concern for companies is how to extend the cooperation in the supply network to implement the sustainability strategy.

METHODOLOGY

This research is based on a single in-depth case study that investigates how sustainability spreads in the supply network. In contrast to several studies in the supply chain management that focus on the individual companies or adopt dyadic perspective, this study has investigated how a sustainability initiative launched by a focal company has spread to many levels in the supply network. The study covers the focal company and several tiers of suppliers.

As this research adopts a network perspective, single case study is more appropriate due to the context specificity of the research issue and connectedness of multiple actors in the supply network that increases its complexity (Halinen and Törnroos, 2005). Several authors advocate the adoption of single case study especially in situations where there is a need for greater depth and rich explanation for the phenomena. Easton (2009) indicated that the single case study should be able to stand on its own by providing in-depth and comprehensive understanding. Järvensivu and Törnroos (2009) argued that "*neither single nor multiple-case studies should be evaluated in terms of the generalizability of the resulting knowledge (i.e. the universality of the theory) but rather in terms of whether the results contribute to contextual insights*".

Dubois and Gadde (2013) in their article "Systematic combining- A decade later", made distinctions between the arguments for multiple cases and single case study. They concluded that the choice depends on "*what the researcher wants to achieve*" and is conditioned by the case perspective on having "*thickness and deep-probing analysis*" which makes adopting a single case study in this research more appropriate. In addition, abduction approach has been adopted

during the case study (Dubois and Gadde, 2002) for developing and testing the theory as it suits more the research context and questions of this study.

Case Study selection

This study is part of a research project that investigates the strategies of companies for spreading sustainability in their supply networks. The selected company for this study fits several key criteria such as being a world leader in its industry and has a high sustainability profile which has been verified by checking its website contents on sustainability. The focal company in this study is one of the world leading chemical companies and has a high ranking on Dow Jones Sustainability Index. The company has many well-established sustainability programs and activities toward implementing sustainability across its supply network. A sustainability initiative has been selected for investigation which fits a main requirement of crossing the company's border and involving several tiers of suppliers.

The unit of analysis has been the sustainability initiative "developing a bio-based chemical product" which has permitted tracing it beyond the company's border to its supply network. This facilitates identifying the actors who are involved in implementing the initiative and contacting them for interviews. Appendix 1 provides some information on the interviewed companies.

Data Collection Process and Analysis

Eight companies are involved in the study that consists of the focal company, and seven suppliers located at different levels in the supply network. The data collection process is primarily based on conducting semi-structured interviews where an interview protocol is developed to guide the interviewing process and data collection. All the interviews are digitally recorded and transcribed. The interviews have taken place either physically by visiting the company to do a face-to-face interview or over telephone if the supplier is located out of Europe such as suppliers located in Asia and Latin America. Total number of interviews is seventeen with an average duration of one hour. Some interviews lasted for more than two hours especially with the persons who are the main actors in designing and implementing the sustainability initiative.

The interviews are conducted with multiple informants from different functions and responsibilities. These include for example director of supply chain, procurement director, sustainability manager, global purchasing director, marketing manager, sales director, senior business development manager and senior managing director. Some details on the interviewees are provided in Appendix 1. This has enabled collecting data on the sustainability strategies that the companies adopt, knowing the history behind the development of the initiative and having a better perspective on the progress of the initiative in the supply network. In addition to the interviews, the companies offered various sources of information such as access to their archival records, annual reports and presentation materials. In one occasion, the partner of the focal company offered us the opportunity to attend a dedicated conference on sustainability at the chemical industry which assisted in understanding the trend of sustainability development in the chemical industry. All the information gathered during the interviews or from the company through secondary sources assisted in achieving data triangulation.

The analysis process is based on manual coding which starts by coding the interviews transcripts. Codes are grouped into different categories to generate a pattern coding. This has been followed by developing a roll-ordered matrix to compare the answers of the interviewees. The coding process has been done according to the recommendation of Miles and Huberman (1994).

FINDINGS OF THE CASE STUDY

In this section the chronological events behind the development of the sustainability initiative are described and followed by presenting the development of the business model for cooperation between the actors in the supply network.

AkzoNobel's Sustainability Efforts in The Supply Network

The focal company and the initiator of the sustainability initiative in this study is AkzoNobel, the world leading chemical company for decorative paints, performance coatings and specialty chemicals. The company's headquarter is in Amsterdam and operates in 80 countries and has 50,610 employees. In 2012 AkzoNobel has achieved revenues of 15.4 billion Euros.

Sustainability has been integrated in the business strategy of AkzoNobel. The company has identified several sustainability targets such as reduction of carbon footprint in its supply network by 25-30% and achieving 20% sales from sustainable products. In addition, the company endeavors to be seen green in the industry and utilize that as a differentiating factor in the market. Accordingly, sustainability has been considered by AkzoNobel as a long-term strategy for improving its competitiveness.

To realize these objectives, the company has figured out that it should reduce its dependence on fossil materials and increase usage of renewable materials for producing its products. The company has identified a set of products that could be developed into sustainable products. All business units at AkzoNobel measured their carbon footprint to identify the sources that contribute to CO2 emission. At powder coating division, Epoxy material has been found to be the biggest contributor to CO2 emission and that's related to some of its components that are derived from crude oil. In addition, resin is considered one of the most important sourced materials by AkzoNobel where resin and latex represent more than 34% of total spend.

AkzoNobel started searching for suppliers who could participate in fulfilling its sustainability objectives. The company looked into the whole supply network and not only to its first tier suppliers but to the second tier till the crude oil sources. This has enabled AkzoNobel to have a better view on what is going on in the supply network in terms of development and innovation activities in the bio-based materials and technologies, and detecting the green alternatives for its feedstock.

Solvay's Sustainability Efforts in The Supply Network

Solvay company is headquartered in Brussels and has 111 sites in 55 countries, 13 major global research & innovation centers and total employees of 29,100. In 2012 Solvay has achieved 12.4 billion Euros as net sales. Solvay's products served several markets such as consumer goods, automotive, energy, environment, construction, agriculture, electricity, electronics, paper and

other industries. Solvay is a world leader in several products such as Sodium Bicarbonate and Soda Ash which are used for pharmaceutical, food and cosmetics industries.

The company has oriented its sustainability strategy toward developing sustainable products to increase its competitiveness and position in the market. In 1980s, Solvay was a world leader in producing Epichlorohydrin (ECH) from Propylene where ECH was used for different applications in the industry. As part of the chemical process the synthetic Glycerin was produced from the hydrolysis of ECH and Glycerin was very profitable during those days. In the 1990s there was a boom in the biodiesel industry which resulted in an overcapacity in Glycerin production. The overcapacity of Glycerin lowered its prices dramatically and the situation became even much worse as oil prices went up and accordingly the prices of Propylene were raised. Solvay and other synthetic producers of Glycerin forced to stop its production. Solvay started considering of closing down some of its factories. To save the situation, the chemistry researchers at Solvay suggested that the chemical reaction can be reversible meaning that Glycerin can be used to produce ECH material for the chemical products. Solvay started developing the idea and finally managed to register the product Epicerol as a patent. The developed product is based on Glycerin which is a by-product from the oleo-chemical and bio-diesel industries. The main raw materials used of producing bio-diesel are rapeseed, soybean and palm oil.

Solvay started marketing the green ECH or Epicerol by approaching several end users of ECH such as the automotive and painting companies. Solvay is located further upstream in the value chain and such efforts represent going three tiers forward in the network. For example, Solvay sells Epicerol to Epoxy manufacturers who then sell Epoxy to companies such as AkzoNobel who then sells it to other companies such as automotive companies, airplane manufacturers or at the stores for the end consumers. Solvay also targeted other applications. The use of composites in windmill blades production is a promising area that Solvay is targeting to market its Epicerol product since windmill is a totally green application used for generating renewable energy and it is important that materials used in it are also sustainable or renewable.

Solvay has adopted a network perspective and made analysis at several tiers backward and forward in its network. This has enabled Solvay to detect the sustainability trends in the market, identify the gaps and reconcile the market requirements for sustainability with its internal capabilities.

In developing Epicerol product based on bio-based materials, Solvay aims to be seen as a preferred ECH supplier for Epoxy manufacturers. On the other hand, product price, especially the commodity products, is very sensitive in the chemical industry and that implies that companies when developing sustainable or green products they have to be price competitive to be adopted. The technology for developing Epicerol is very competitive compared with the technology of producing traditional ECH based on petrochemical materials. Thereby, Solvay has been able to achieve both objectives of developing a product that is green and cost competitive.

Cooperation and Partnership Development Between AkzoNobel and Solvay

AkzoNobel came to know about Solvay's Epicerol material. They approached Solvay offering to collaborate with each other to achieve their objectives. AkzoNobel aims to reduce its dependence on fossil-based supply chain and at the same time achieve its main objective of reducing its

carbon footprint. Solvay has done the life cycle analysis (LCA) for Epicerol showing the advantages of the product compared to traditionally ECH based on Propylene. Solvay proved that 1 ton of Epicerol would save 2.5 Tons of CO2 compared with traditional ECH as detailed by LCA report of Epicerol and AkzoNobel was very satisfied with the results.

The deal with AkzoNobel has been a real business opportunity for Solvay and they were thrilled when AkzoNobel who are their 2nd tier customer approached them. The important outcome from the deal is that AkzoNobel has given a sustainability dimension to Epicerol in the market since Solvay approached other chemical companies before the deal with AkzoNobel but with no positive response. The approached companies showed no real interest since their major concern was price and that didn't matter for them if the product is bio-based or petro-based. AkzoNobel has acted as a promoter of Epicerol and at the same time adopting Epicerol for producing Epoxy would improve the company's image and assist in differentiating it in the market.

Solvay was enthusiastic when approached by AkzoNobel as the deal represents a marketing initiative at a large scale for both parties. AkzoNobel considers Solvay as a partner and thus develop a partnership with Solvay to develop the use of Epicerol in its Epoxy resin manufacturing. They described the cooperation between the two parties as perfect since there is a match in their spirits and have similar sustainability objectives of serving better the world. The Director Future-Proof Supply Chain at AkzoNobel described the cooperation with Solvay as "*I think there is a perfect match between them and us, in the intent to bring the world to a better place, I think it's easy to work together with someone like that. It is more psychological match. We both seek to grow*". For AkzoNobel the deal can be described as a pure sustainable procurement initiative since there has been no price advantage when adopting Epicerol compared to ECH. At the end Epoxy price supplied to AkzoNobel will not be affected whether it is based on ECH or Epicerol.

Relationship between AkzoNobel and Solvay is not new as it is common in the chemical industry that companies buy and sell to each other even if they are competitors. There are some transactions going on between the two companies for other materials before the cooperation over this initiative happened. In the bio-based Epoxy initiative, the relationship has taken a new form of close collaboration and partnership between the two parties. The initiative has technical and managerial issues that need close coordination and that's make the relationship different than traditional relationships between a buyer and seller. This has given an attribute to this sustainability initiative as it has happened between a customer (AkzoNobel) and its second tier supplier (Solvay). This is quite unusual in the chemical industry and has embodied one of the rare examples on such type of cooperation.

Supply Network Development of Bio-Based Epoxy

There was a concern during the development of business model between Solvay and AkzoNobel on how to announce the agreement and which actors to include. There was a discussion on whether to choose one supplier to be the single actor who buys Epicerol from Solvay and manufacturers bio-based Epoxy. AkzoNobel was reluctant to this suggestion as they wanted to keep multiple sourcing strategy and negotiation power which is very important for the company. Another issue is by limiting the suppliers who are involved in the business model then other suppliers will be dissatisfied and that may affect Solvay's business as well. At the end, Solvay

and AkzoNobel have agreed to keep the board open for the suppliers who want to join the business model.

Several Epoxy suppliers have been approached by AkzoNobel discussing the new sustainability initiative and using Epicerol from Solvay instead of ECH for producing Epoxy resin. For Epoxy manufacturers who are not backward integrated it has been easier for them to adopt Epicerol while suppliers who are backward integrated and petro-based are reluctant to switch to using Epicerol from Solvay. During the negotiation between AkzoNobel, Solvay and Epoxy manufacturers, AkzoNobel has made it clear from the begining that there will be no premium for the actors in this initiative as the goal has to remain competitive in the market. There was no monetary discussion between Solvay and AkzoNobel over the deal as explained by the senior business development manager "*we have a lot of enthusiasm that we share with AkzoNobel, I think it also facilitates the relationship as we don't have to negotiate the price, actually we never talked about money.* This can be understood as Solvay is not the direct supplier for AkzoNobel since Epoxy manufacturers are located between them. Solvay makes negotiation with their customers (the Epoxy Resin manufacturers) who are in turn supply Epoxy materials to AkzoNobel. Therefore, there is no direct monetary discussion between Solvay and AkzoNobel.

Although there will be no premium in this initiative, the suppliers who agree to use Epicerol materials from Solvay for producing Epoxy resin will benefit from getting more allocated volume from AkzoNobel for bio-based Epoxy resin and accordingly they will be in a better position than before. Solvay will benefit from the scale effect as it will deliver Epicerol at a large scale and both Solvay and Epoxy manufactures in addition to AkzoNobel can utilize this synergy to reap market benefits.

ANALYSIS

This section discusses the case study and the importance of adopting a network view for assessing how sustainability spreads across the supply network, the change it induces and how the business relationship characteristics can facilitate the implementation of the sustainability among the actors in the supply network. The supply network for bio-based Epoxy initiative is shown in figure 1.

Sustainability Spread in the Supply Network

The case study has described the evolvement of the sustainability initiative "developing bio-based Epoxy product" at three levels. The first level is within the single companies of AkzoNobel, who is the originator of the initiative, and Solvay who is an essential partner to drive the initiative. The second one is at the dyadic level that is related to the development of partnership between AkzoNobel and Solvay to form the basis for implementing the initiative. In this study considering sustainability at the dyadic level between AkzoNobel and Solvay has been crucial in order to form the nuclei for building the supply network of the initiative. Both companies have their strategies oriented toward sustainability and that has assisted in formulating the partnership. The third level is the network level which includes forming the business model that involves several actors in the supply network.

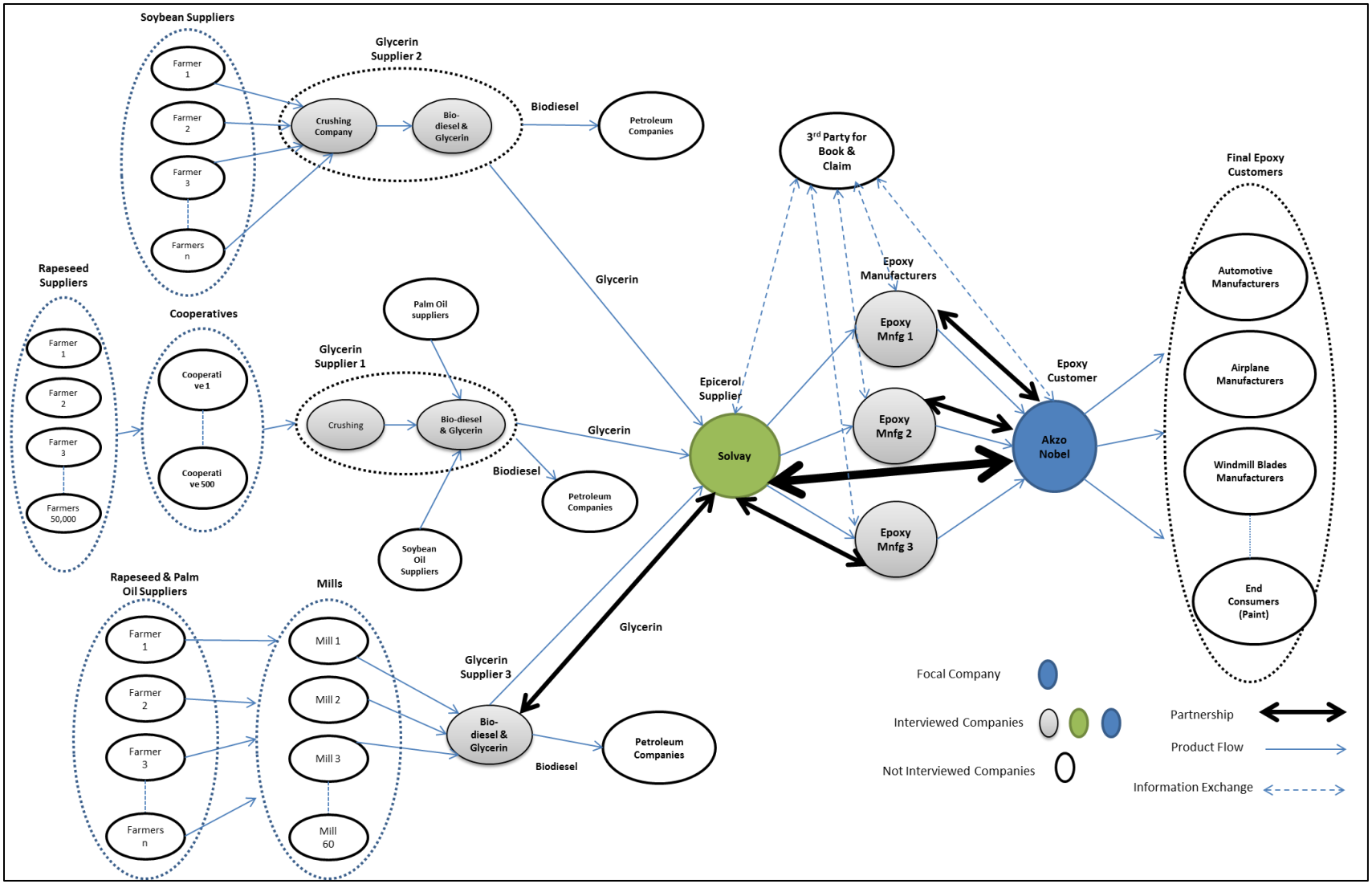

Figure 1. Supply Network for Bio-Based Epoxy Product

This case study provides evidence of the importance of adopting the network view in spreading and implementing the sustainability as emphasized by several authors (Leek, 2012; Nogueira et al., 2010; Seuring and Gold, 2013). The adoption of network view has been evident in the endeavors of both AkzoNobel and Solvay for looking at potential partners (suppliers and customers) in their networks. It has been very essential for AkzoNobel to move beyond the dyadic perspective that includes the first tier suppliers to identify potential partners for implementing sustainability. Likewise, Solvay has developed a green product (Epicerol) and made intensive efforts in the market by going beyond its first and second tier customers and reached customers in the third tier and end consumers. This had assisted Solvay in detecting the sustainability trends in the market.

Adopting the network view as shown in figure 1 has been essential for AkzoNobel to see how the sustainability initiative spreads across the supply network and how the sustainability requirements of different industries, such as the chemical and agriculatural industries, intersected and tackled. AkzoNobel has to make sure that the whole supply network of producing the green product Epoxy has no negative aspects to avoid having issues related to sustainability. For example the palm oil suppliers had previously issues in the media for deforestation and Nestle company was associated with this sustainability problem which affected badly its reputation. Solvay has made sure that it deals with suppliers who are part of Roundtable on Sustainable Palm Oil (RSPO). A French supplier to Solvay who is a Bio-diesel and Glycerin manufacturer has made intensive efforts through monitoring and educating the cooperatives and farmers to improve their sustainability practices. This would provide Solvay and AkzoNobel with some guarantees on the sustainability situation further upstream in the supply network.

To verify the sustainability performance of the suppliers, AkzoNobel has launched a program called Supplier Support Visit Program where AkzoNobel conducts physical visits to the premises of its suppliers in regions such as China, India and Brazil. The aim of the program is to evaluate the suppliers' sustainability performance and educate them to upgrade their sustainability knowledge and skills. These efforts have facilitated AkzoNobel's task in convincing some Epoxy manufacturers to adopt Epicerol from Solvay and be part of the business model. Likewise, Solvay has approached its suppliers of Glycerin enquiring about its sources of raw materials and their sustainability practices. There have been several efforts by Solvay to encourage its suppliers to adopt the sustainability practices in the agricultural sector and had some discussions with the suppliers over the methods to improve their practices. Solvay also went beyond its first tier suppliers (Bio-diesel and Glycerin producers) and assessed the sustainability issues at the farmers who provide various materials such as soybean, rapeseed and palm oil to the bio-diesel producers.

Change in Supply Network Due to The Sustainability Initiative

The chemical industry market is very competitive and AkzoNobel has been aware that development of sustainable products should have economic benefits as well or don't induce a trade-off between between the economic and environmental performances. One drawback that faced AkzoNobel when approaching the Epoxy manufacturers was that several players in the chemical industry are backward integrated which means that these actors' supply chains are petro-based and switching to materials that are bio-based would be very costly to them. When reviewing the technology and production of Epoxy material AkzoNobel has found that Epoxy

manufacturers can accommodate the Epicerol in their production processes and lines since it is a drop-in technology. Consequently there will be no major changes to their operations, processes and machines. Still some Epoxy manufacturers who are backward integrated found it costly and difficult to use bio-based materials due to the investment they have made previously.

The second dilemma that faced AkzoNobel was how to separate the production of Epoxy based on Epicerol from the one that is based on ECH (a petro-based material). The Epoxy manufacturers who agree to join the initiative will continue using ECH for producing Epoxy for other customers. Having a separate production line is very costly and will undermine the Epoxy manufacturers' operational efficiency. This would have reflection on increasing the price of Epoxy which AkzoNobel tries to avoid from the outset of the initiative.

AkzoNobel has devised a new methodology called Book & Claim. It is basically an accounting methodology where a nominated 3rd party will monitor the delivered quantities of Epicerol from Solvay to the Epoxy manufacturers and guarantee that the ordered quantity of Epoxy based on Epicerol by AkzoNobel has been delivered completely by the Epoxy manufacturers.

AkzoNobel has been successful in avoiding making radical changes to the actors' production lines and processes. This has been very essential for the implementation and success of the initiative. However there have been some administrative activities at Epoxy manufacturers such as accommodating Epicerol in the production process along with ECH materials and that requires some monitoring and controlling activities.

At Solvay's side, the company has established a factory in Thailand and another one is under construction in China to meet the new demand for Epicerol and fulfill AkzoNobel's requirements and other customers. Consequently some suppliers of Solvay have made some changes to their plants to meet Solvay's requirements. For example the Glycerin supplier 3 has built a refinery column for Glycerin material. The other two Glycerin suppliers 1 and 2 have made no investments or changes to their operations. Figure 2 indicates the type of changes that have occurred in the bio-based Epoxy supply network.

It can be concluded that generally there has been neither disturbances to the companies' activities pattern nor to their resources structure. The major changes that happened at Solvay and Glycerin Supplier 3 have occurred to be utilized for this initiative and meeting other customers requirements.

The actors in this initiative have avoided making new investments, developing new learning curves and incurring risks due to the new situation. This has been essential for the success of the initiative. The change induced by the sustainability initiative is incremental in nature since it doesn't require major changes to the actors' activities and resources (Dahlin and Havila, 2008). In addition, the sustainability initiative and its induced changes have no negative effects on the already established relationships between the actors in the supply network. On the contrary is has enhanced the relationships in some situation between the actors as will be explained in the next section. Due to the interconnectedness of the actors, the change can be classified as connected (Halinen et al., 1999) since it is not limited to the single or dyadic relationships but extended to affect several actors in the supply network.

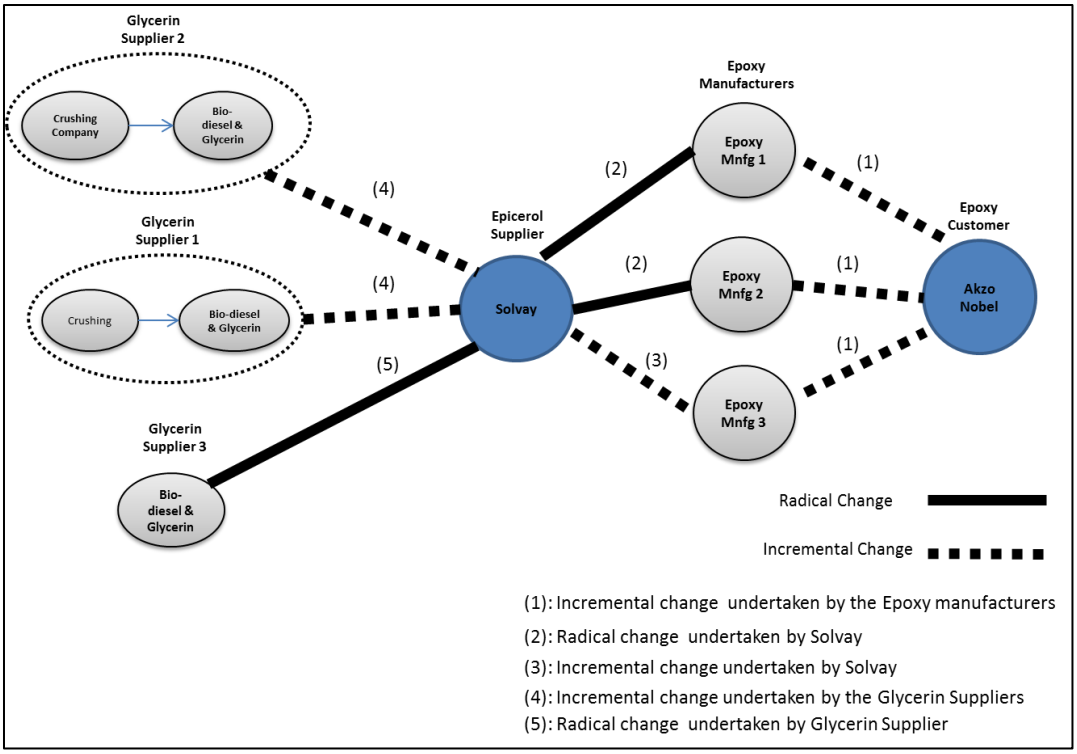

Figure 2. Type of change in the bio-based Epoxy supply network

Role of Business Relationship Characteristics in Implementing The Sustainability

Through adopting the network view, AkzoNobel has managed to develop a partnership with Solvay which has formed the basis for developing the business model and supply network for producing bio-based Epoxy. Both AkzoNobel and Solvay shared the same view on the importance of sustainability to the future of their businesses and improving their competitiveness in the market. As the initiative has meant a long-term cooperation, there has been no opportunistic behavior and both parties aimed to create a win-win situation. As the senior business development manager at Solvay indicated "*I think what was a key success factor with AkzoNobel was the fact it's a win-win, I think it is a kind of marketing initiative so both companies benefit from the reputation of the other*". This has assisted in enhancing the trust between AkzoNobel and Solvay as both parties need each other to achieve their strategic objectives and sustainability targets.

Both AkzoNobel and Solvay are one of the leading chemical companies in the world and it seems that the two companies have not exploited their power in this initiative as they haven't tried to coercively enforce their requirements and conditions in the deal. AkzoNobel has utilized its business relationships with Epoxy manufacturers to convince them to adopt the Epicerol in their production. AkzoNobel has long-terms relationships with the Epoxy manufacturers and utilized the cooperation and trust atmosphere in convincing the Epoxy manufacturers to join the initiative and be part of the business model even if there has been no price increase for the Epoxy manufacturers. The Epoxy manufacturers 1 and 2 have described the relationship with AkzoNobel as partnerships and they have joined the initiative in order to maintain the relationship and also be part of the AkzoNobel's plan for business growth.

Solvay has long-term relationships and a partnership with the two Epoxy manufacturers 2 and 3 respectively while the relationship with the Epoxy manufacturer 1 is relatively new. The business relationships between Solvay and Epoxy manufacturers have assisted in implementing the initiative taking into consideration that financial incentive in this initiative doesn't exist as there is no premium for all the actors. Thus the major focus between them has been on practical implementation of the initiative.

Due to the establishment of new factories in Thailand and China, Solvay has established new business relationships with Glycerin suppliers 2 and 3. Solvay has been considered a major customer for these two Glycerin suppliers. The business relationships have been characterized with trust and cooperation. For Glycerin supplier 1 the relationship with Solvay is a long-term and characterized by high trust and cooperation. Table 1 summarizes the type of business relationships between the actors and the level of power, trust and cooperation between them.

Table 1. Business Relationships Types and Characteristics Between The Actors in The Business Model

	Solvay				**AkzoNobel**			
Company	Business Relationship Type	Power	Trust	Cooperation	Business Relationship Type	Power	Trust	Cooperation
Solvay	----	----	----	----	Partnership	Not Exploited	High level of trust	High level of cooperation
Epoxy Mnfg 1	Less than 5 years transactional relationship	Not Exploited	Moderate	Moderate	Long term and partnership (15 years)	Prime customer but power is not exploited	High level of trust	High level of cooperation
Epoxy Mnfg 2	Long-term (more than 10 years) and close relationship	Not Exploited	Moderate	Moderate	Long-term (more than 10 years) and partnership	Prime customer but power is not exploited	High level of trust	High level of cooperation
Epoxy Mnfg 3	Long-term relationship (more than 10 years) - Partnership	Not Exploited	High level of trust	High level of cooperation	Very long-term relationship (more than 20 years), transactional relationship	Not Exploited	Moderate level of trust	Moderate level of cooperation
Glycerin Sup 1	Long-term relationship (more than 18 years) – very close relationship	Not Exploited	Moderate	Moderate	----	----	----	----
Glycerin Sup 2	New relationship (2 years) – very close relationship	Not Exploited	High level of trust	High level of cooperation	----	----	----	----
Glycerin Sup 3	New relationship (3 years) very close and partnership	Not Exploited	High level of trust	High level of cooperation	----	----	----	----

Solvay's power is limited when it comes to validating the sustainability practices of the farmers since they are in the fourth or fifth tier in the bio-based Epoxy supply network. Glycerin suppliers are aware of the importance of sustainability especially for complying with the regulations and have made intensive efforts in checking, educating and improving the farmers' sustainability practices. The French Glycerin supplier has established a dedicated team whose sole responsibility is to conduct research and development on best practices in the agriculture which sustainability is part of it and disseminate the developed knowledge across the collaborators and farmers. Thereby, Solvay didn't need to interact directly with the farmers or collaborators to monitor their sustainability practices and relied on its Glycerin suppliers.

It can be concluded that the business relationship characteristics of trust and cooperation have been essential elements to create alignment between the actors and prevent opportunistic behavior. They also assist the actors in the supply network to work toward achieving a well-defined objective which has been producing bio-based Epoxy to green the supply network. Table 2 provides some quotes of the interviewed suppliers on their business relationships with AkzoNobel and Solvay.

Enhancing the business relationships with a high level of trust is seen as a prime condition for improving supply network responsiveness as indicated by Handfield and Bechtel (2002). Hadjikhani and Thilenius (2009) concluded in their study also that higher trust leads to higher commitment in the business relationships between the actors. Although there were some conflicts between the actors at the early phases of the initiative but they were essential to solve them at the beginning and operationalize the initiative.

Power dimension has not been exploited in this initiative. One justification can be attributed to the nature of this initiative where the monetary factor is absent. Consequently the other dimensions such as trust and cooperation are the key dimensions that drive the other actors to join the initiative. Another point is related to type of change that is induced by this initiative. Actors incurred minor changes and the initiative doesn't induce disruption to their processes and operations. Thus, AkzoNobel and Solvay were not forced to use their power in the supply network to influence the other actors in this initiative.

Table 2. Quotes of Suppliers on the business relationships with AkzoNobel and Solvay

Company	Suppliers Quotes on Business Relationships Types
Epoxy Mnfg 1	"Actually we didn't have any specific problem with AkzoNobel and Solvay. We have very friendly and much more close to partnership within AkzoNobel"
Epoxy Mnfg 2	"Very good relationship with AkzoNobel and we call it a partnership relationship. Because we want to grow with them together"
Epoxy Mnfg 3	With Solvay we have kind of partnership. With AkzoNobel it is pure customer-supplier relationship but lasting for very long time"
Glycerin Sup 1	"Solvay, they are by far the number one client and very strategic. They are the only client that we have such long term contracts as we have five years contract"
Glycerin Sup 2	"The relationship is excellent in all the ways. I think it is a very good business for both companies we have very respectful and very good relationship we started to enforce the supply contract almost two years. It's an excellent relationship"
Glycerin Sup 3	"We started to develop the relationship we have so many discussions actually before we built the plant five years ago we had crude glycerin and we talked to them and the relationship developed until we built the refinery column for them in particular"

CONCLUSION

This paper has investigated through a single case study how sustainability propagates across the supply network through adopting the IMP network approach. Specifically the paper has investigated how the sustainability initiative launched by a focal company spreads to different tiers of actors in the supply network. The paper has studied also the type of change that is induced in the supply network due to the sustainability initiative and demonstrated that the incremental and continuous change have been essential for the implementation and success of the initiative. This finding is in line with Harrison and Easton (2005) who argue that the most preferred change for firms is when it is continuous, can be dealt with internally and causes less disruption to the companies' processes or routines.

The role of business relationship characteristics has been vital for implementation of the sustainability initiative. The developed trust and cooperation between the actors to create win-win situations are very essential to the success of the initiative. AkzoNobel and Solvay have been able to utilize the long-term relationships with their suppliers to facilitate implementation of the initiative although the initiative doesn't include immediate economic benefits. Power dimension has not been exploited and has no effective role in forcing the actors in the business model to implement the sustainability initiative. The success of the sustainability initiative is contingent more on developing high levels of trust and cooperation between the actors at different tiers in the supply network.

The paper has contributed to filling the gap in the existing literature and research in supply chain management and industrial network approach on how sustainability spreads in the supply network and role of business relationship characteristics in implementing the sustainability. In addition, the paper demonstrates that adopting a network perspective for implementing sustainability requires settings to be considered such as the type of business relationships and their characteristics as well as the type of change that may accrue due to the sustainability effect in the supply network. Confining the study of the sustainability to a single or dyadic perspectives won't allow capturing such effects and settings and may lead to undesired results during the implementation.

Finally, this case study has uniqueness of following sustainability through different industries and business sectors. As the focal company AkzoNobel is operating in the chemical industry, the supply network for the development of bio-based materials has been traced back to the agricultural business and farmers. This coincides with one of the findings and recommendations of Kovacs (2008) as she emphasized the importance of "*research following material and energy flows through several echelons in the supply chain, and across any related industry*" in order to consider the spillover of environmental demand from one industry to another.

MANAGERIAL IMPLICATIONS AND FUTURE RESEARCH

As highlighted by the literature review and demonstrated by the case study, cooperation between actors for achieving sustainability is of paramount. As sustainability cannot be attained individually, companies should adopt a network view to search for opportunities to improve their sustainability performance and utilize the synergies of other actors to achieve its sustainability objectives. In addition, companies should look at multiple levels in the network to develop innovative ideas and successful implementation of its sustainability strategy.

This study is based on a single case study conducted at the chemical industry where implementing the sustainability and developing the supply network for producing bio-based products included incremental and continuous change. There were no major modifications to the existing "path dependency" at the actors. Investigating other types of change as reported in this paper such as the radical and continuous/discontinuous is necessary to know their effects on the sustainability spread.

The study also investigated the role of business relationship characteristics such as trust, power and cooperation on sustainability implementation. Studying other settings of business relationship characteristics to reveal their effect on sustainability would be useful.

REFERENCES

Beske, F. (2012). "Dynamic capabilities and sustainable supply chain management". *International Journal of Physical Distribution & Logistics Management*. Vol. 42 No. 4, pp. 372-387

Blowfield, M., (2000). "Ethical sourcing: A contribution to sustainability or diversion?". *Sustainable Development*, Vol. 8, pp. 191-200

Bowen, F., Cousins, P., Lamming, R. C. and Faruk, A. (2002). "Horses for courses: explaining the gap between the theory and practice of green supply". *Greener Management International*, Vol. 35, pp. 41-60

Canning, L. and Hanmer-Lloyd, S. (2001). "Managing The Environmental Adaptation Process In Supplier– Customer Relationships". *Business Strategy and the Environment*, Vol. 10, pp. 225 – 237

Carter, C.R.; Rogers, D.S. (2008). "A framework of sustainable supply chain management: Moving toward new theory". *International Journal of Physical Distribution & Logistics Management*, Vol. 38 No. 5, pp. 360-387

Dahlin, P., Fors, J., Havila, V., and Thilenius, P. (2005). "Netquakes – Describing Effects of Ending Business Relationships on Business Networks". *21st IMP-conference in Rotterdam, Netherlands*

Dahlin, P. and Havila, V. (2008). "Network Connectivity and Business Netquakes – Ways to Understand the Spread of Change. Paper presented at the 24th IMP Conference

Dubois, A. and Gadde, L-E. (2002). Systematic combining: an abductive approach to case research". *Journal of Business Research*, Vol. 55, pp. 553-560.

Dubois, A. and Gadde, L-E., (2013). "Systematic combining"—A decade later". *Journal of Business Research*, Vol. 67, pp. 1277 – 1284

Easton, G. (2009), "Critical realism in case study research". *Industrial Marketing Management*, Vol. 39, pp. 118–128

Fadeeva, Z. (2004). "Promise of sustainability collaboration—potential fulfilled?". *Journal of Cleaner Production*, Vol. 13, pp. 165–174

Ford, D., Gadde, L-E., Håkansson, H., & Snehota, I. (2003). *Managing business relationships. Chichester*: John Wiley

Gadde, L-E. and Håkansson, H. (2001). *Supply Network Strategies*. John Wiley and Sons Ltd.

Geffen, A., and Rothenberg, S. (2000). "Suppliers and environmental innovation: The automotive paint process". *International Journal of Operations & Production Management*, Vol. 20 No. 2, pp. 166-186

Gold, S. Seuring, S. and Beske, P. (2010). "Sustainable Supply Chain Management and Inter-Organizational Resources: A Literature Review". *Corporate Social Responsibility and Environmental Management*, Vol. 17, pp. 230–245

Hadjikhani, A. and Thilenius, P., (2009). "Industrial relationships and the effects of different types of connections". *Industrial Marketing Management*, Vol. 38, pp. 679 – 686

Halinen, A., Salmi, A., & Havila, V. (1999). "From dyadic change to changing business networks: An analytical framework". *Journal of Management Studies*, Vol. 36 (6), pp. 779−794

Halinen, A. and Törnroos, J-A., (2005). "Using case methods in the study of contemporary business networks". *Journal of Business Research*, Vol. 58, pp. 1285 – 1297

Handfield, R. B., and Bechtel, C. (2002). "The role of trust and relationship structure in improving supply chain responsiveness". *Industrial Marketing Management*, Vol. 31, pp. 367 – 382

Harilainen, H-R., (2009). "Spread Of Corporate Social Responsibility Practices In Supply Networks". *25th IMP-conference in Marseille, France*

Harrison, D. and Easton, G. (2005). "Patterns of actor response to environmental change". *Journal of Business Research*, Vol. 55, pp. 545-552.

Hassini, E., Surtie, C. and Searcy C.,(2012). "A literature review and a case study of sustainable supply chains with a focus on metrics". *Int. J. Production Economics*, Vol. 140, pp. 69–82

Havila, V. and Salmi, A. (2000). "Spread of change in business networks: an empirical study of mergers and acquisitions in the graphic industry". *Journal of Strategic Marketing*, Vol. 8, pp. 105-119.

Håkansson, H. (1982): *International Marketing and Purchasing of Industrial Goods: An Interaction Approach*. John Wiley & Sons Ltd.

Hakansson, H., and Ford, D. (2002). "How should companies interact in business networks?". *Journal of Business Research*, Vol. 55, pp. 133 – 139

Håkansson, H.and Prenkert, F. (2004). *Exploring the exchange concept in marketing. In: Håkan Håkansson, Debbie Harrison and Alexandra Waluszewski (ed): Rethinking Marketing – Developing A new Understanding of Markets*. John Wiley and Sons Ltd. pp. 75 - 97

Håkansson, H.and Snehota, I. (1995). *Analysing Business Relationships, in: Håkan Håkansson and Ivan Snehota (eds): Developing Relationships in Business Networks*. London, Routledge, pp. 24 – 49.

Hertz, S. (1998). "Domino effects in international networks". *Journal of Business-to-Business Marketing*, Vol. 5 (3), pp. 3 –31.

Hines, F., and Johns, R., (2001). "Environmental supply chain management: evaluating the use of environmental mentoring through supply chains". *Sustainability at the Millenium: Globalization, Competitiveness and the Public Trust, January 21-25, 2001 Ninth International Conference of Greening of Industry Network Bangkok*

Hoejmose, S., Brammer, S. and Millington, A. (2012). "Green supply chain management: The role of trust and top management in B2B and B2C markets". *Industrial Marketing Management*, Vol. 41, pp. 609–620

Huang, Y. and Wilkinson, I. F. (2006). "Understanding Power and Trust in Interfirm Relationships: A Dynamic Perspective". *22nd IMP-conference in Milan, Italy*

Järvensivu, T. and Törnroos, J-A., (2010). "Case study research with moderate constructionism: Conceptualization and practical illustration". *Industrial Marketing Management*, Vol. 39, pp.100 – 108

Johnsen, R. E. and Ford, D. (2008). "Exploring the concept of asymmetry: A typology for analyzing customer–supplier relationships". *Industrial Marketing Management*, Vol. 37, pp. 471–483

Johnsen, T.E., Johnsen, R.E., and Lamming, R.C. (2008). "Supply relationship evaluation: The relationship assessment process (RAP) and beyond". *European Management Journal*, Vol. 26, pp. 274–287

Kotzab, H., and Skjøtt-Larsen, T. (2009). "Supply chain management on the crossroad to sustainability: a blessing or a curse?". *Logist. Res.*, Vol. 1, pp. 83–94

Kovács G. 2008. "Corporate environmental responsibility in the supply chain". *Journal of Cleaner Production*, Vol. 16 (15), pp. 1571-1578

Leek, S. (2012). "Comments on Applying a network level in environmental impact assessments". *Journal of Business Research*, Vol. 65, pp. 256–257

Miemczyk, J., Johnsen, T. E., and Macquet, M. (2012). "Sustainable purchasing and supply management: A review of definitions and measures at the dyad, chain and network levels of analysis". *Supply Chain Management: an International Journal*, Vol. 17 (5), pp. 478-496

Miles, M.B. and Huberman, A.M., (1994). *"Qualitative Data Analysis: An Expanded Sourcebook"*. 2nd ed. Thousands Oaks, Calif., London: Sage

Nogueira M, Araujo L, Spring M. (2010). "Signalling sustainability strategies: preliminary findings from two case studies". *26th IMP Conference. Budapest-Hungary*

Öberg, C., Huge-Brodin, M. and Björklund, M. (2012). "Applying a network level in environmental impact assessments". *Journal of Business Research*. Vol. 65, pp. 247-255.

Ritvala, T. and Salmi, A. (2010) "Value-based network mobilization: A case study of modern environmental networkers". *Industrial Marketing Management*, Vol. 39, pp. 898 – 907

Rogers, D. and Tibben-Lembke, R. (2001), "An examination of reverse logistics practices", *Journal of Business Logistics*, Vol. 22 No. 2, pp. 129-48

Sako, M. and Helper, S. (1998). Determinants of trust in supplier relations: Evidence from the automotive industry in Japan and the United States. *Journal of Economic Behavior & Organization*, Vol. 34, pp. 387-417

Sarkis, J., Zhu, Q. and Lai, K-h (2011). "An organizational theoretic review of green supply chain management literature". *Int. J. Production Economics*, Vol. 130, pp.1–15

Seuring, S., & Gold, S. (2013). "Sustainability management beyond corporate boundaries: from stakeholders to performance". *Journal of Cleaner Production*, Vol 56, pp. 1- 6

Seuring, S. and Muller, M. (2008). "From a literature review to a conceptual framework for sustainable supply chain management". *Journal of Cleaner Production*, Vol. 16, pp. 1699–1710

Simpson, D.F. and Power, D.F. (2005). "Use the supply relationship to develop lean and green suppliers", Supply Chain Management: An International Journal, Vol. 10 No.1, pp. 60-68

Spekman, R.E., and Carraway, R. (2006). "Making the transition to collaborative buyer–seller relationships: An emerging framework". *Industrial Marketing Management*, Vol. 35, pp. 10 – 19

Srivastava, S. K. (2007). "Green supply-chain management: A state-of-the-art literature review", *International Journal of Management Reviews*, Vol. 9, issue 1, pp. 53-80

Tate W. L., Lisa M. Ellram, L. M., and Gölgeci, I. (2013). Diffusion of environmental business practices: A network approach. *Journal of Purchasing & Supply Management*,19, pp. 264–275

Van Bommel, H., (2011). "A conceptual framework for analyzing sustainability strategies in industrial supply networks from an innovation perspective". *Journal of Cleaner Production*, Vol. 19, pp. 895 – 904

Vachon, S. (2007). "Green supply chain practices and the selection of environmental technologies". *International Journal of Production Research*, Vol. 45, No 18-19, pp. 4357-4379

Vachon, S. and Klassen, R. (2006). "Extending green practices across the supply chain – The impact of upstream and downstream integration". *International Journal of Operations & Production Management*, Vol. 26 No. 7, pp. 795-821

Waluszewski, A., Hadjikhani, A. and Baraldi, E. (2009). "An interactive perspective on business in practice and business in theory". *Industrial Marketing Management*, Vol. 38, pp. 565–569

Zhu, Q., Sarkis, J., Lai, K-h., and Geng, Y. (2008). "The Role of Organizational Size in the Adoption of Green Supply Chain Management Practices in China". *Corporate Social Responsibility and Environmental Management*, Vol. 15, pp. 322–337

Zsidisin, G. and Siferd, S. (2001). "Environmental purchasing: a framework for theory development". *European Journal of Purchasing & Supply Management*, Vol. 7, pp. 61-73

Appendix 1. Information on companies participating in the sustainability initiative – developing a bio-based product

Company	Location in The Supply Network	Description/ Activities	Size of the company	Location	Interviewees Function/ Responsibility	Number of Interviews
AkzoNobel	Focal Company	Specialty chemicals, performance coatings and decorative paints	Large (50,610 employees)	Netherlands	– Spend Area Main Buyer Renewables – Procurement Director Powder Coatings – Corporate Sustainability Manager – Director Future-proof Supply Chains – Global Purchasing Director Packaging & Director Sustainable – Supply Chain Director Performance Coatings – Global Purchasing Director Resins & Precursors	7
Solvay	2nd Tier Supplier (Partner to the focal company)	Chemical products such as caustic soda, sodium bicarbonate, advanced materials Plastics such as specialty polymers and Vinyl Solvents, amines and many chemical products	Large (29,100 employees)	Belgium	– Senior Business Development Manager – Supply Chain Manager – Corporate Sustainable Manager – Chlorvinyls Raw Material Procurement Manager	4
Epoxy Mnfg 1	1st tier Supplier	Epoxy resin and hardener	Large (700 employees)	South Korea	Senior Managing Director	1
Epoxy Mnfg 2	1st tier Supplier	Various chemical products such as adhesives, intermediates for pharmaceuticals, epoxy resin and packing materials	Large (600 employees)	Taiwan	Marketing & Sales Manager	1
Epoxy Mnfg 3	1st tier Supplier	polyurethane catalysts, epoxy adhesives, epoxy powder coating, electrical insulating materials and propylene carbonates	Medium - Large (250 employees)	Switzerland	Marketing Manager Coating & Construction	1
Glycerin Sup 1	3rd Tier Supplier	Bio-diesel and Glycerin	Large (8000 employees)	France	Sales Director	1
Glycerin Sup 2	3rd Tier Supplier	Bio-diesel and Glycerin	Large	Argentina	Sales and Marketing Manager	1
Glycerin Sup 3	3rd Tier Supplier	Bio-diesel and Glycerin	Large (800 employees)	Thailand	Company Director	1