

**COMPETITIVE ADVANTAGE
FROM SUSTAINABILITY MARKETING
OF BIO-BASED PRODUCTS**
**A multiple case study of three sustainable chemical
companies' sustainability marketing**

**Jyväskylä University School
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ABSTRACT

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Title of thesis Competitive advantage from sustainability marketing of bio-based products – A multiple case study of three sustainable chemical companies’ sustainability marketing	
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Abstract <p>This study focuses on the opportunities sustainability marketing provides for competitive advantage of new sustainable bio-based products, namely bio-based materials and chemicals. Sustainability marketing is studied in B2B context. Study follows a multiple case study approach.</p> <p>Theory base for the research derives from strategic management theory since the key question that strategic management aims to answer is why some companies perform better than others. Furthermore, the study synthesizes relevant streams of thought in strategic management with contemporary sustainability strategy concepts and marketing approaches to develop an integrative theory-based conceptual framework. This framework links sustainable value -concept with upgraded marketing mix.</p> <p>The created framework is utilized in the analysis of three sustainability leaders from chemical industry, particularly their sustainability marketing. This study shows that case companies were implementing sustainable value – concept in their sustainability strategies, emphasizing product stewardship and clean technology strategies. Furthermore, elements from sustainable value -concept can contribute to sustainability marketing and provide an opportunity for competitive advantage. Main contributions of the study are the conceptual framework for sustainability marketing and description of the features of successful sustainability marketing strategy for bio-based chemicals and materials. Also further research opportunities are introduced at the end of the study.</p>	
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Tiivistelmä <p>Tutkimus keskittyy kestävyysmarkkinoinnin mahdollisuuksiin tuoda kilpailuetua uusille biotuotteille eli biomateriaaleille ja -kemikaaleille. Kestävyysmarkkinointia tutkitaan yritysmarkkinoinnin kontekstissa. Tutkimuksen lähestymistapa aiheeseen on monitapaustutkimus.</p> <p>Tutkimuksen teoria pohjautuu strategisen johtamisen teoriaan, koska strategisen johtamisen teoria pyrkii vastaamaan kysymykseen, miksi toiset yritykset pärjäävät paremmin kuin toiset. Lisäksi tutkimus yhdistää strategisen johtamisen suuntauksia ajankohtaisiin markkinointisuuntauksiin ja konsepteihin kestävyysstrategiasta sekä kehittää näistä teoriapohjaisen käsitteellisen kehysten. Käsitteellinen kehys yhdistää kestävä arvo -konseptin ja päivitetyn markkinointi-mixin.</p> <p>Luotua kehystä hyödynnetään kolmen kemianteollisuuden kestävyysjohtajayrityksen analysoinnissa. Analysoinnin kohteena on erityisesti yritysten kestävyysmarkkinointi. Tutkimus osoittaa, että tapausyritykset toteuttivat kestävä arvo -konseptia kestävyysstrategiassaan, keskittyen tuotevastuun ja puhtaan teknologian strategioihin. Lisäksi havaittiin, kestävä arvo -konseptin elementtejä voidaan hyödyntää kestävyysmarkkinoinnissa ja ne voivat luoda kilpailuetua. Tutkimuksen tärkeimmät tuotokset ovat kestävyysmarkkinoinnin käsitteellinen kehys sekä biokemikaalien ja -materiaalien menestyksikkään kestävyysmarkkinointistrategian ominaisuuksien kuvaus. Lisäksi lopuksi esitetään jatkotutkimusaiheita.</p>	
Asiasanat kestävä markkinointi, biotuotteet, kilpailuetu, kestävä arvo	
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LIST OF ABBREVIATIONS

B24B	Business to Four Billion
B2B	Business to Business
BoP	Base of the Pyramid, Bottom of the Pyramid
BP	British Petroleum
CSV	Creating Shared Value
DJSI	Dow Jones Sustainability Index
EBITDA	Earnings Before Interest, Taxes Depreciation and Amortization
EU	European Union
FSC	Forest Stewardship Council
GHG	Greenhouse Gas
GMO	Genetically Modified Organisms
ISCC	International Sustainability and Carbon Certification
ISO	International Organization for Standardization
ILO	International Labour Organization
LEED	Leadership in Energy and Environmental Design certification
LCA	Life Cycle Assessment
MNC	Multinational Company
NGO	Non-governmental Organization
P2	Pollution Prevention
PBS	Polybutylene succinate
PEFC	The Programme for the Endorsement of Forest Certification
RBV	Resource Based View
ROCE	Return on Capital Employed
ROI	Return on Investment
RSB	Roundtable for Sustainable Biomaterials
RSPO	Roundtable on Responsible Palm Oil
RTRS	Roundtable for Responsible Soy
TCO	Total Cost of Ownership
TfS	Together for Sustainability
SBC	Sustainable Biomaterials Collaboration
WWF	World Wildlife Found

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ABSTRACT

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1 INTRODUCTION

1.1 Background

The need and opportunities for sustainable business solutions have been noticed by some companies, for example General Motors in clean technology and Unilever at the base of the pyramid markets (Hart, 2010). Furthermore, in academic research an emerging marketing paradigm shift that is characterized by proactive corporate strategies in ecology, proactive social engagement and the base of the pyramid markets, has been detected (Achrol & Kotler, 2012). However, Hart and Dowell (2011) claim, that still many companies persist in doing business at competed markets and are focusing on sustainability strategies that are based on incremental improvement such as eco-efficiency, pollution prevention, product stewardship and corporate social responsibility (Hart & Dowell, 2011). Similarly, the academic sustainability marketing research seem to focus on the competed markets in developed markets as well and appear to be characterized having “greening” (Hart, 1997) or “bolt-on” (Laszlo & Zhexembayeva, 2011) sustainability approach instead of considering the special features of the marketing of new products and business models that mitigate environmental and social problems.

Bio-based materials and bio-based chemicals have been introduced much earlier than petrochemical based products but they still hold a potential for innovations that create new products and markets to fulfil today’s sustainability demands. Seeing that modern business strategy concepts propose competitive advantage is gained by creating innovative technologies and new limitedly competed markets (Kim & Mauborgne, 2004; Christensen, 2006), it is a significant benefit for bio-based products that they can be used to replace dwindling and less sustainable fossil originated products with competitive cost (Hermann, Blok, & Patel, 2007). Therefore it can be expected that sustainable bio-based products could contribute beneficially to the competitive advantage of a company.

The role of marketing is becoming more critical in companies as Achrol and Kotler (2012, p. 41) found:

“This leaves what used to be classic “manufacturing firm” close to becoming a pure marketing company.”

They see that the primary function of the focal firm will be marketing and branding. Marketing is particularly important in commercializing new sustainable products (Sikdar & Prakash, 2010). Conventional marketing principles and practices are of course applicable for sustainable products, but there are also special features that should be addressed by research to find the opportunities for further development of the marketing domain. Furthermore, considering sustainability marketing there is a very profound contradiction between these two terms, sustainability and marketing. Brundtland commission defined sustainable development in 1987 in its report “Our common future” as follows:

“Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (World Commission on Environment and Development, 1987, p. 41).

This definition serves as a base for most of the sustainability activities and also for sustainability marketing. The idea of marketing has been for long to create needs and wants to consumers and the strategies of marketers in the past have been based on the assumption of infinite resources. Sustainability, on the contrary, is all about finite resources and using them sparingly so that the future generations will have at least the same opportunities that the current generations have. This poses a challenge to the companies and marketers and there is a need for marketers to re-examine their theory and practices, revise policies on product development, pricing, distribution and branding. (Kotler, 2011.)

For the reasons presented above it is clear that updated approaches towards sustainability marketing deserve more attention and that bio-based chemicals and materials as innovative sustainable products serve as a great product example for studying the issue. In this study sustainability marketing is understood as application of company sustainability strategies in marketing strategy and practice. This definition is grounded in the literature review and applied in the multiple case study analysis.

1.2 Scope of the study

According to Porter (1985) the long run above average performance is based on competitive advantage. But how do companies gain competitive advantage from sustainability and sustainability marketing? There are a number of concepts and theories designed to help companies in defining and organizing their business possibilities and risks. Most of these concepts and theories address general business strategies but there are also some more narrowly targeted at sustainability and marketing areas. When analysing the potential arising from sustainability for a company it is claimed that it should not be done separately from the economic situation and business strategy (Reinhardt, 1998). Instead, it is advised to use the same frameworks for analysing the prospects for sustainability that is used to guide the core business choices (Reinhardt, 1998; Porter & Kramer, 2006; Laszlo & Zhexembayeva, 2011). This approach facilitates

finding the sources of opportunity, innovation and competitive advantage rather than costs, constraints or charitable deeds (Porter & Kramer, 2006). Hence, this study utilizes such approach for both sustainability and sustainability marketing, and the sustainability marketing framework described here is derived from business, sustainability and marketing strategy research. Studies considering single, dual or tertiary approaches in the areas of concern are included and the common areas of interest are further developed (Figure 1).



FIGURE 1 The focus area of the study is sustainability marketing, the intersection of three strategy fields.

Strategy set of a large corporation includes specific strategies for different levels: corporation, business and functional strategies. Obviously, sustainability can, and should be, incorporated to strategies at all levels. Bonn and Fisher (2011) present the widely used descriptions for these three different strategies. According to them, corporate strategy concerns the optimal set of diverse businesses which involves decision making about product/market diversity, geographical coverage and the pursuit of acquisitions and strategic alliances as well as resource allocation between businesses. Furthermore, they describe that business strategies deal with individual businesses or business units whereas functional level strategies cover the company function areas such as marketing. The three strategy tiers are touched in this thesis when formulating the sustainability marketing strategy approach for a bio-based product business.

Although in the sustainability management research the three approaches on sustainability - environmental, social and economic - are already integrated (Baumgartner & Ebner, 2010), in marketing research they have still remained mostly separate (e.g. Sharma et al, 2010; Chikweche & Fletcher, 2012). This investigation is to add knowledge on sustainability marketing by contemplating all three dimensions together.

This study concentrates on bio-based products. Chemical industry is a natural context for exploring bio-based products and business, because chemical companies act as buyers, producers and suppliers of bio-based chemicals and materials. More detailed scoping of bio-based products is presented in Chapter 2.1. Geographically this research is focused on European chemical companies. Specifically, the study focuses on European sustainability leaders that belong to the world Dow Jones Sustainability Index (DJSI) in 2012. The case companies discussed in this thesis are located in the Netherlands and Germany.

1.3 Research design and research questions

This thesis consists of a literature review and a multiple case study in which the units of analysis are three sustainability leader companies from chemical industry. Data for the case studies was collected by semi-structured interviews during 2013 and from document sources such as company web pages (2013, 2016 and 2018) and annual reports (2014 and 2015). In regards of this study, one key assumption is that companies listed on DJSI (world) represent typical cases (Yin R. , 2003) of companies that have gained competitive advantage from sustainability and further, sustainability marketing. Therefore they predict similar results, that is to say, cases illustrate literal replication (Yin, 2014). As actual research propositions are not presented, the conceptual framework guides the data collection and analysis instead (Yin R. , 2003).

The overall aim of the study is to describe successful sustainability marketing strategy elements of bio-based materials and chemicals' business to gain competitive advantage. Research questions are used to guide the research process and delimit the study by helping to identify the relevant information that is collected from the case companies (Yin, 2014):

RQ1: How is competitive advantage derived from sustainability marketing, based on literature?

RQ2: What kind of sustainability strategy portfolios are the sustainability leaders in chemical industry executing? Focus on elements that relate to bio-based products.

RQ3: How should the sustainability strategies be expressed in marketing, particularly in the context of marketing mix to succeed in the markets? Focus on most important elements that relate to bio-based products.

To support the aim and answering the research questions, research objectives were established:

RO1: Provide a compact review of the sustainability issues of bio-based chemicals and materials from literature.

RO2: Develop an integrated conceptual framework and simultaneously provide insight into managing the sustainability marketing by synthesizing some

of the theories available in strategic management with insights available in the sustainability strategy and marketing literature.

RO3: Analyse the sustainability strategies of the case companies.

RO4: By utilizing the conceptual framework, identify elements of sustainability marketing approach chemical companies are using and that are applicable for bio-based products' marketing.

This thesis is organized as follows: Chapter 2 describes the grounds and doubts of bio-based products' sustainability. Chapter 3 provides a review on business strategy theory field and identifies the key elements of contemporary views for businesses to gain competitive advantage. Chapter 4 introduces a sustainability strategy framework that aligns with the key elements of business strategies. Furthermore it's relation to other sustainability strategy frameworks and concepts is discussed. Chapter 5 concentrates on the foundations of marketing strategies and the implementation. Chapter 6 presents the conclusions from the literature review, and the three strategy areas are synthesized into sustainability marketing conceptual framework that is applicable to analysing sustainability marketing of bio-based chemicals and materials. Chapter 7 presents the research methods used in the empirical part. Chapter 8 provides and discusses the multiple case study results. Finally, in Chapter 9, the conclusions are drawn and proposals for future research are provided.

2 BIO-BASED PRODUCTS IN CHEMICAL INDUSTRY

This chapter introduces bio-based chemicals. In addition, it provides a compact review of the sustainability issues of bio-based chemicals and materials from literature which was one of the research objectives.

2.1 Bio-based materials

Figure 2 illustrates the different routes to produce bio-based products from renewable feedstocks. This study concentrates on the bio-based chemicals and chemical building blocks, polymers, resins and composites. They are derived from different kinds of biomass, algae, bacteria, crops, trees, marine organisms and biological waste from households, animals and food production (Cherubini, et al., 2009). Out of the scope are biofuels (except ethanol, which can be used as building block for polyethylene), fertilizers, food and feed products. Also traditional use of bio-based products, such as starch and oils, is not included to the scope of this study.

Bio-based products are commonly categorized in three groups according to their raw materials. First generation raw materials are usually considered to include the feedstocks that are easiest to process and therefore already widely used, but on the other hand the drawback is that they have direct competition with food production. Examples of first generation raw materials are starch and sugar crops including sugar cane and corn and many vegetable oils like palm oil. With the term second generation feedstock is usually referred to non-food raw material such as lignocellulose based biomass, non-edible vegetable oils and waste biomass. Third generation feedstock typically refers to photosynthetic algae.

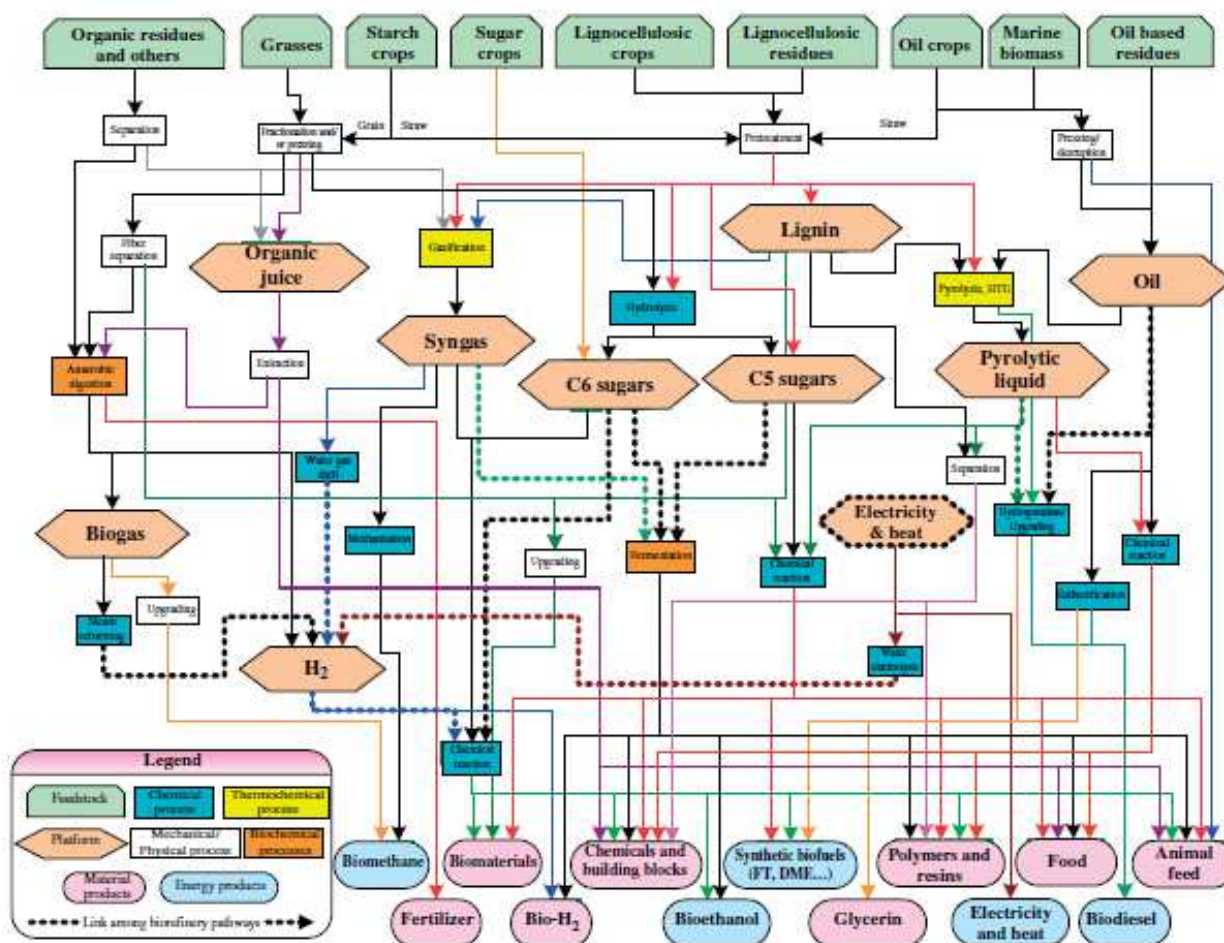


FIGURE 2 Biorefinery classification system. Reprinted from “Toward a common classification approach for biorefinery systems” by Cherubini et al., 2009, *Biofuels, Bioprod. Bioref.* 3 p. 543. Copyright 2009 by Society of Chemical industry and John Wiley & sons, Ltd. Reprinted with permission.

2.2 Sustainability of bio-based products

Bio-based products can contribute significantly to sustainable development (de Jong, Higson, Walsh, & Wellisch, 2012). They have several advantages as they have renewable origin and preserve scarce resources and cause less greenhouse gas (GHG) emissions compared to fossil originated products (Hermann, Blok, & Patel, 2007).

However, a bio-based product is not always more sustainable option than a corresponding fossil originated product - neither from the environmental (Lammens, Potting, Sanders, & De Boer, 2011), social (Hall, 2011) or economic (de Jong, Higson, Walsh, & Wellisch, 2012) point of view. Hence, there are several issues to be considered when evaluating the sustainability of bio-based products.

There are no universally agreed sustainability criteria for bio-based chemicals and materials, but there exist some proposals for sustainability principles that can be applied to bio-based products. Most attention has been given to the sustainability of

the raw material and its production. Several certification schemes have been developed for bio-based products to show and ensure that the feedstock production is following sustainability principles and that the origin of the raw materials can be tracked with a chain of custody system along the value chain. Schemes exist for different feedstocks and they also have differing sustainability guidelines, but many of them follow the European Union's (EU) Renewable Energy Directive (RED) sustainability criteria which set legally binding requirements for the sustainable production and use of agricultural raw materials in biofuel production (European Parliament and the Council of the European Union, 2009). Applicable schemes for the bio-based chemicals and materials according to the feedstock are Bonsucro for sugar cane, ISCC (International Sustainability and Carbon Certification) Plus for all kind of biomass, RSB (Roundtable on Sustainable Biomaterials) global sustainability standard for all kind of biomass, RTRS (Roundtable on Responsible Soy) for soy, and RSPO (Roundtable on Responsible Palm Oil) for palm oil. The scope of the schemes differs as some set mandatory criteria only to the production of feedstock whereas some demand sustainability from several parts of the value chain operations (ISCC, 2012; RSB, 2013). Their applicability to different products also varies. For example, ISCC Plus can be used for bioplastics, but not other bio chemicals in the scope of this study whereas Bonsucro can be used to certify all sugar cane derived products (Bonsucro, 2011; ISCC, 2012).

Beyond certification schemes, the development of sustainability criteria for the bio-based products seem to focus on bioplastics production. At this point it should be noted that the term bioplastics differs from the term bio-based plastics and they should not be used interchangeably. Bioplastics incorporate both bio-based plastics and biodegradable plastics wherein the latter can be also petroleum-based (European Bioplastics, 2012).

One set of sustainability criteria for bioplastics is developed by Sustainable Biomaterials Collaboration, (SBC) (Sustainable Biomaterials Collaboration, 2009). Table 1 introduces the 12 criteria to address economic, environmental as well as social sustainability. In contrary to the approach followed in this thesis, SBC separates health issues from social dimension of sustainability and highlights the health issues as the fourth dimension of sustainability (criteria 5). The SBC criteria include guidelines for favouring bio-based feedstocks instead of fossil ones (criteria 3), emphasizing life cycle approach (criteria 2, 4, 6, 12), resource efficiency (criteria 1,7), chemical safety (criteria 7, 10, 11) and feedstock producers and the production environment (criteria 7, 8).

In addition to the SBC criteria, there exists an evaluation tool called Sustainable plastics scorecard, developed by a non-profit organization Clean Production Action which also acts as the coordinator of SBC. Accordingly, the approach of this benchmarking tool is very similar to SBC guidelines. Sustainable plastics scorecard is neither restricted to bio-based products, but it takes the benefits of renewable raw materials in scoring into account. The most of negative effect to scoring of bio-based plastics comes from pesticide use, the use of genetically modified organisms (GMO) in the field, unsustainable agriculture practices and non-compostability (if a single use product). (Clean Production Action, 2013)

TABLE 1 Sustainability criteria for bioplastics (Sustainable Biomaterials Collaboration, 2009).

1. Reduce the amount of material, product and packaging used	7. Encourage agricultural systems that are sustainable for farmers, the environment, farmworkers and communities. Eliminate hazards of concern during feedstock production, conserve, protect and build soil, conserve nutrient cycles, protect air and water access and quality, promote biological diversity, reduce overall energy use and its impacts, reduce transportation impacts, develop and certify a comprehensive sustainable agriculture plan, protect workers' health and safety and provide fair compensation.
2. Eliminate single-use products that can be neither recycled nor composted	8. Support small to mid-sized family owned and operated farms
3. Avoid fossil fuel-based materials in favor of materials and products derived from renewable feedstocks	9. Do not use GMOs in agricultural feedstock production
4. Address sustainability across the life cycle of the material: the growing of the feedstock, manufacturing of the biomaterial and final product, using the product and reclaiming the material at the end of its original use.	10. Use chemicals that meet the 12 Principles of Green Chemistry. These principles pursue the design and production of chemicals in a way that minimizes the potential for health and environmental hazards
5. Define sustainability to include issues of environment, health, and social and economic justice	11. Avoid engineered nanomaterials and chemicals that have not been tested for environmental and public health effects across the life cycle.
6. Design and use products that is reusable, recyclable or compostable	12. Decentralize production and buy locally to reduce the environmental footprint of production, transportation, and consumption.

Álvarez-Chávez et al. (2012) have also contemplated environmental, health and safety issues connected to bio-based materials, concentrating on bio-based plastics. Their approach aligns mostly with SBC guidelines and Sustainable plastics scorecard, but also differences can be found. One major distinction in the proposal of Álvarez-Chávez et al. (2012) is that they suggest sustainable bio-plastics production should not affect food supply, whereas the two other sources (Clean Production Action, 2013; Sustainable Biomaterials Collaboration, 2009) do not mention the issue separately. Interference with food chain is probably the biggest public concern and controversy with bio-based products until today. In the biofuel business, which can be regarded to be a few steps ahead of other bio-based chemical businesses, the problem has already gained more attention, and the issue has been addressed for example in the development of EU legislation. The European Commission has proposed that half of the targeted 10 % biofuels use in 2020 should be gained from non-food biofuels and so the non-food based biofuels would benefit from their origin (European Commission, 2012).

The approach, in favour of non-food feedstocks, takes into account the direct competition of first generation feedstocks with food and feed use of the same crops. On the other hand, some have also raised the concern that the indirect interference with food production should be considered. Therefore the focus should be in the effective use of land regardless the type of feedstock being used because the competition is essentially for land where to grow the food, feed or feedstock for bio-based products (Carus & Dammer, 2013). This approach sets the first generation and land-based second generation feedstocks parallel on the same level, because the productivity is the key issue. From this viewpoint, non-land based feedstocks, such as waste fractions

and autotrophic algae, could be seen as the most sustainable feedstock option. However, the bioplastics producers argue that the land use demand for bioplastics is negligible in relation to food and feed production and the increasing efficiency in raw material and agricultural technology will further assure the balance between the raw material use for bioplastics versus food and feed end uses (European Bioplastics, 2013). It remains to be seen whether the debate will gain as much attention in bio-based chemicals and materials business as it has gained in terms of biofuels, and furthermore, if there will be legal obligations or incentives for the origin of the bio-based chemicals and materials raw material.

Another remarkable difference, compared to SBC guidelines and Sustainable plastics scorecard, in Álvarez-Chávez et al. (2012) is that they consider the use of genetically modified organisms (GMO) in bio-based product's processing. They suggest that it is not acceptable to use GMO neither in raw material production nor in processing and manufacturing phases. Sustainable plastics scorecard, in turn, addresses the problems associated with GMO used in the field but does not punish using GMO in manufacturing processes (Clean Production Action, 2013). Similarly, SBC (2009) recommends against the use of GMO in raw material production in the field, but allows the use of genetically engineered organisms, enzymes and other entities in manufacturing processes if they are contained within the processing system and not viable outside. SBC emphasizes the importance of evaluating the viability of GMO outside the system and refers to the United Nations Cartagena Protocol on Biosafety (United Nations, 2000) in the matter.

Many of the bio-based products are produced with the help of bacteria, yeast or alga that are genetically modified. The industry believes the product itself is not GMO when using GMO biocatalysts, but as noticed from the differing viewpoints, there is a possibility that the stakeholders may not accept the view and the related risks. The risks to business and sustainability have been noticed and a call for open communication and engagement of the stakeholders has been presented to avoid the risk realization. (Sheridan, 2013)

3 BUSINESS STRATEGIES - HOW TO GAIN COMPETITIVE ADVANTAGE?

The issues regarding competitive advantage are dominantly contemplated in business strategy domain. There are two abundantly used definitions for competitive advantage and those are from Porter (1985) and Barney (1991). Their contributions to the business strategy field are widely acknowledged and cited in research literature, especially, when defining the competitive advantage. However, new advanced views of the means to gain the competitive advantage have been established since. Accordingly, this review on business strategies begins with the basis set by the Porter's theory and the resource based view (RBV), and further continues to consider the means that have evolved along since and at least partially as a response to new evolved markets. In this chapter the relevant theories and definitions of competitive advantage are introduced to provide an overview of the research on the area and to support the further development of sustainability marketing framework.

3.1 Competitive advantage

According to Porter's (1985) definition competitive advantage appears when a company is able to create more value to the buyer than the cost of creating the value is and at same time either the price is lower compared to rival products or the benefits to customer are higher than the price difference. Related to this definition he introduced three generic strategies for pursuing the competitive advantage which are cost leadership, differentiation and focus strategy. The first one, cost leadership, requires company to offer equal benefits with lower price than others. Differentiation strategy, in turn, means that company should be able to provide extra benefits that more than offset the price difference to rival product. While these two strategies have a broad scope, the third one, focus strategy, is targeted at a narrow segment. Focus strategy is always combined with two other strategies meaning it can be either focus cost leadership or focus differentiation strategy. Focuser chooses a segment or group of segments in the industry and optimizes its strategy to serving them to the exclusion of others. (Porter, 1985).

Porter (1985) stresses the importance of choosing the type of competitive advantage the company is aiming for cost leadership or differentiation and the scope within which it will attain it meaning focus strategy or a plain version of before mentioned strategies. Without making the choice and trying to serve "all things to all people" the company often has no competitive advantage at all (Porter 1985).

Another approach to competitive advantage is found from the resource based view. While in Porter's theory the foundation of competitive advantage is the offerings cost or difference compared to competitor's offerings (Porter, 1985, p. 3), competitive advantage in RBV is based on simultaneous value creation and non-imitable strategy. According to RBV, a company has sustained competitive advantage when it has a value creation strategy that no other firm is using and others cannot imitate. RBV is

based on the assumption that resources are heterogeneous and not perfectly mobile between companies and by enhancing such valuable resources companies gain competitive advantage. (Barney, 1991)

In this study these approaches are referred to as 'traditional views' to competitive advantage. Although using the term 'traditional', Porter's view as well as RBV are also based on preceding work of earlier scholars (Teece et al., 1997).

3.2 The sources of competitive advantage in traditional views

Porter's theory and RBV can be seen competing with each other (e.g. Teece, et al. 1997). While the first derives the competitive strategy from the opportunities and threats associated with the company's external factors, the latter uses the internal analysis of the company strengths and weaknesses as a strategy starting point (Barney, 1991). However, in this study they are seen as complementary approaches - two sides of the same coin.

Porter's generic strategies for competitive advantage (Porter, 1985) are based on industry structure analysis and correct positioning on the market. Porter (1985, p. 4) has identified five competitive forces universal to all industries that determine the industry profitability and attractiveness:

- threat of new competitor entry,
- threat of substitute products or services,
- bargaining power of buyers,
- bargaining power of suppliers and
- the rivalry among existing competitors.

It is obvious that these five factors and their importance vary between industries but they can also change over time in an industry. Companies are not locked to the position or industry structure and passively drifting along. Instead, they can affect their own position on the markets and also the industry structure with their competitive strategies (Porter 1985).

In resource-based view the controllable resources inside the company are seen as the source of competitive advantage (Barney, 1991). Wernerfelt (1984) and Barney (1986, 1991) focus on the resources while other scholars have built on their works and contemplate the core competencies' (Prahalad & Hamel, 1990), capabilities' (Grant, 1991) and dynamic capabilities' (Teece, Pisano, & Shuen, 1997) role in pursuing competitive advantage. Barney's (1991) major contribution to the theory of competitive advantage was to argue that resources holding the potential of sustained competitive advantage must be *valuable* for exploiting opportunities and/or neutralizing threats in the firms environment, *rare* among present and future competitors, imperfectly *im-*

itable and *non-substitutable*. He was echoing the profound idea of Porter's differentiation strategy which requires company to provide its customers something *unique* and *valuable* beyond simply offering a low price compared to its competitors and also Porter's five forces included already the idea of *non-substitutable* products and services (Porter, 1985). Despite Barney describing resources and Porter offerings, notably, they both were highlighting the same characteristics.

Although Porter's competitive strategy is based on external analysis, he introduced value chain analysis as a tool for finding the sources of competitive advantage inside the company. A company value chain consists of primary activities and support activities. Primary activities include inbound logistics, operations, outbound logistics, marketing and sales as well as service. Support activities are for instance firm infrastructure, human resource management, technology development and procurement. Performing these activities in a way that provides lower cost or better differentiation compared to rivals is the source of competitive advantage. (Porter, 1985.)

RBV, in turn, puts forth that resources can be tangible or intangible assets, strengths or weaknesses of a firm, like brand names, in-house knowledge of technology, employment of skilled personnel, trade contacts, machinery, efficient procedures and capital (Wernerfelt 1984). Resources can be categorized in three groups: physical capital resources, human capital resources and organizational capital resources (Barney, 1991).

There is a clear overlap in the value chain analysis and RBV, but the approach is different. Porter's value chain constituents focus on describing activities while RBV, in contrast, covers variety of company features.

3.3 Evolved views to gain competitive advantage

Porter's theory and RBV have been criticized and refined further by other scholars. New versions and extensions of both theories are developed to include larger network around the company and additionally Porter's theory is challenged in concentrating on competitor benchmark and in obligating to choose between cost leadership and differentiation (e.g. Normann & Ramírez, 1993; Kim & Mauborgne, 1997). These evolved views, that challenge the traditional means to gain competitive advantage, are discussed next.

Porter's value chain approach is further developed to different kind of value network models and correspondingly, RBV is extended to take into account the recourses in the external network of the firm. Instead of concentrating on the company or the industry, these theories contemplate the business networks from different perspectives. Stabell and Fjeldstad (1998) shifted the focus to value network formed by customers in which the customer interaction is accomplished through the mediating technology provided by the company. On the contrary, Normann and Ramirez (1993) focused on the value network that is the value creating system itself, including the market stakeholders such as suppliers, business partners, allies and customers who co-produce the value. In their model, the companies try to find the best fit of competen-

cies and customers by changing the roles and relationships of the players in the network which they call value constellations. Value constellation model is close to Moore's (1993) view of business ecosystems, which instead of a single industry consists of variety of industries. In business ecosystem companies work together but also compete to produce value to the customer (Moore, 1993).

Similarly, Dyer and Singh (1998) have extended RBV outside the company with their relational view and present that competitive advantage may rise from idiosyncratic inter-firm linkages. They rationalize that by combining complementary resources companies can gain even more valuable, rare and difficult to imitate resource base that acts as a foundation for greater relational rents, compared to a single company, leading to competitive advantage. This relational view still has quite a narrow perspective as the focus is on firms and especially in supplier network.

These different network proponents seem to derive from the stakeholder theory (Freeman R. , 1984) although it is not acknowledged in the papers reviewed for this study. However, they do not introduce the whole set of stakeholders but are restricted to the market stakeholders instead. They neglect the idea that company networks can be assessed even more broadly with the help of the stakeholder theory, which sees stakeholders as "groups and individuals who can affect or are affected" by the business (Freeman, Harrison, Wicks, Parmar, & de Colle, 2010, p. 5). The stakeholder theory approach includes both market and nonmarket stakeholders.

Concentrating on competition and on competitive position as a benchmark was challenged by Kim and Mauborgne with their *value innovation* approach (Kim & Mauborgne, 1997) and *blue ocean strategy* concept (Kim & Mauborgne, 2004). Moreover, Christensen's (2006) principles of *disruptive innovation* are also offering new insights into traditional management of successful companies. Kim and Mauborgne (2004) propose that the focus should be on value creation to the company and the customer, and value innovators offer tremendous leap in value by distinguishing the relevant factors from all the factors the industry competes on instead of concentrating on incremental improvement of competitor benchmark factors. The key is to focus on the factors that unite the customers instead of offering more customized products to finer segments (Kim & Mauborgne, 1997). The relevant factors can be identified by answering the questions: What factors can be eliminated that the industry has taken for granted? What factors can be reduced well below the industry's standard? What factors can be raised well above the industry's standard? What factors can be created that the industry has never offered? (Kim & Mauborgne, 1997).

Moreover, Kim and Mauborgne (2004) argue that there is no need for a company to choose between cost leadership and differentiation because it is possible to adopt simultaneously. The idea behind the blue ocean strategy is simple: companies should find and develop markets where there is little or no competition and then exploit and protect them. Blue oceans are those new markets with limited competition whereas red oceans are battle fields for companies suffering on the crowded markets where prospects for profit and growth are limited (Kim & Mauborgne, 2004). Blue oceans can be created by two ways, either by creating a totally new industry or by altering the boundaries of an existing industry (Kim & Mauborgne, 2004). Christensen (2006) also encourages companies to seek for new markets with innovations, especially in the case of large companies that are already in the phase of commercial success. He claims that

to create disruptive innovations, companies should forget the traditional management views and not always listen to their existing customers, but to accept also new lower-performance products that promise lower margins and furthermore, they should aggressively pursue also smaller markets. Blue oceans are said to emerge only when company utility, price and cost activities are properly aligned (Kim & Mauborgne, 2004). Kim and Mauborgne (2004) argue that blue ocean strategy creates significant economic and cognitive barriers for imitation which is in line with RBV approach on competitive advantage. It should be noted that Porter also addresses the importance of parity and proximity principles which mean that a cost efficient company should differentiate as far as it does not affect the costs and differentiator should diminish the cost as much as it does not jeopardize differentiation (Porter, 1985). Nevertheless, the advantage of the blue ocean framework can be seen in its aim to set the differentiation focus further and so it extends the differentiation leap to give the company greater advantage.

In conclusion, the means to gain competitive advantage can be found by analysing the external environment of the company (Porter, 1985), and by building and developing internal capacities of the company (RBV). In both cases the focus should be in valuable, rare, in-imitable and non-substitutable constituents (Porter, 1985; Barney, 1991). Value, rarity, in-imitability and non-substitutability can be enhanced by collaboration with variety of stakeholders (Normann & Ramírez, 1993; Moore, 1993; Stabell & Fjeldstad, 1998; Freeman, Harrison, Wicks, Parmar, & de Colle, 2010) and by seeking and entering new limitedly competed markets with innovative products and business models (Kim & Mauborgne, 2004; Christensen, 2006). The value and cost of the offering to customer should be well in balance with the cost to seller (Porter, 1985; Kim & Mauborgne, 2004).

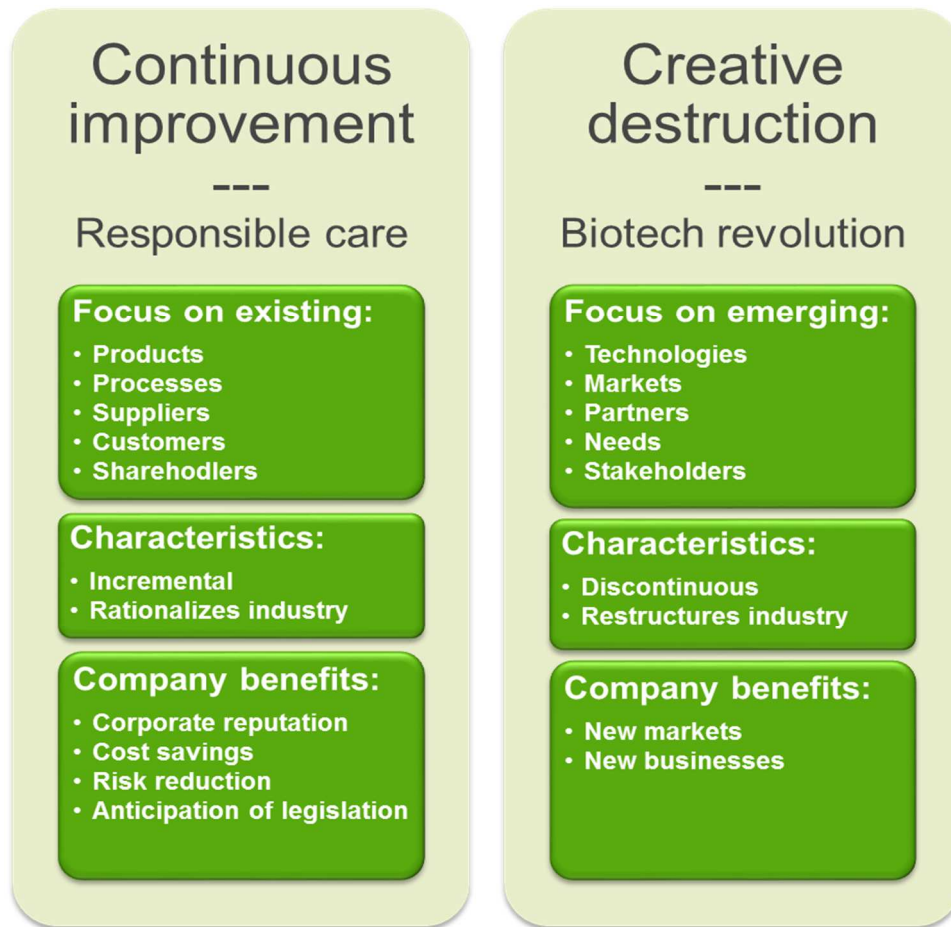
4 SUSTAINABILITY STRATEGIES - HOW TO ACCOMPLISH SUSTAINABLE BUSINESS?

Sustainable value concept forms the core of the sustainability approach used in this study and it represents a corporate level strategy portfolio. Naturally, the corporate level decisions should be expressed in other level strategies as well, including business and marketing strategies. This section presents a short overview of recent trends in sustainability strategy field and further concentrates on the sustainable value concept that will be discussed in more detail together with its connections and discrepancies to business strategies as well as other relevant sustainability strategy approaches.

4.1 Integrated and innovative sustainability strategies

As presented in the Chapter 1.2, it is beneficial to combine sustainability and business by looking sustainability through the lens of business strategies. Accordingly, Reinhardt (1998) echoes the voice of Porter and RBV by arguing that sustainability issues should be considered through industry structure, position and internal capabilities. Besides, there can be detected at least two strategic approaches that combine sustainability and business strategies, namely, *integrated sustainability* actions and so called *innovative sustainability* actions (Halme & Laurila, 2009), in other words, *greening* and *beyond greening* strategies (Hart, 1997). In the integrated strategy the sustainability actions are integrated to core business and improve the environmental and social aspects of existing core business whereas in the innovation strategy the actions extend the core business or develop new businesses to alleviate social or environmental problems (Halme & Laurila, 2009). These two types of strategies can be also described as the strategies leading to continuous improvement and the strategies leading to creative destruction (Hart, 2010). Table 2 illustrates the differences between the two kinds of strategies by using chemical industry's Responsible Care program and biotechnology revolution as examples.

TABLE 2 Comparing strategies aiming to continuous improvement with strategies aiming to creative destruction. Adapted from Hart (2010, p. 113), originally adapted from Hart & Milstein (1999) and Halme & Laurila (2009).



Many recent framework proposals pertain to the innovative sustainability strategies. Consequently, it seems that there is a growing interest in considering the prosperity of the whole community and business success more holistically. Furthermore, it appears that the academic emphasis on recent sustainability frameworks is slightly shifting from environmental sustainability towards social sustainability, although the total sustainability including all three sustainability aspects is still the main target.

One such concept example is the Creating Shared Value (CSV) concept proposed by Porter and Kramer (2011). They have been developing the concept during last decade (Porter & Kramer, 2006) and define shared value as “policies and operating practices that enhance the competitiveness of a company while simultaneously advancing the economic and social conditions in the communities in which it operates” (Porter & Kramer, 2011). The concept provides three ways to create economic value by creating societal value: reconceiving products and markets, redefining productivity in the value chain, and building supportive industry clusters at the company’s locations (Porter & Kramer, 2011). Their work has also faced criticism targeted especially to the philanthropy aspect of the concept (Aakhus & Bzdak, 2012). However, there are other similar viewpoints presented about at the same time. These include Sustainable Value (Hart, 1995; Hart, 1997; Hart & Milstein, 2003; Hart, 2007), Stakeholder Capitalism

(Freeman R. , 1996; Freeman, Martin, & Parmar, 2007; Freeman, Harrison, Wicks, Parmar, & de Colle, 2010) and Conscious Capitalism (Sisodia, 2009) concepts. They all call for new conception of capitalism – using capitalism as a tool but instead of aiming to maximize the profit just for the business, it should aim to create prosperity for the society at large, including the business. However, it should be noted that the question is not about redistributing the wealth (Porter & Kramer, 2011).

In this research it was chosen to build on Hart's sustainable value concept because it serves a clear comprehensive framework and could be used as an analysing tool (Hart & Milstein, 2003; Hart, 2010) that takes into account different development stages of sustainability strategies including both greening and beyond greening strategies. Another important element is that it clearly considers the three aspects of sustainability: economic, environmental and social sustainability. Furthermore, Hart's sustainability strategy framework aligns with the main key points of relevant business strategy concepts presented earlier (see Chapter 3.3) and it supports the aims of this study.

4.2 Creating sustainable value

Hart has developed the sustainable value -concept stepwise since the 1995 published article "A Natural-Resource-Based View of the Firm". In this early paper he mainly concentrates on environmental sustainability, but gives hints about forthcoming: "...firms must build markets in the South while reducing the environmental burden created by this new economic activity" (Hart, 1995). Later, after introducing the bottom of the pyramid strategy to reduce poverty (Prahalad & Hart, 2002) also social sustainability aspects have been in the core of the concept (Hart & Milstein, 2003; Hart & Dowell, 2011). This study mainly relies on the latest version of the theory and framework presented in the article (Hart & Dowell, 2011) and the book (Hart, 2010). A drawback in the framework is that certain traditional social sustainability issues such as employee safety and product safety issues are not paid attention to.

Hart (2007) presents a company sustainability strategy portfolio should consist of balanced combination of four strategies to gain shareholder value in the long run and furthermore, applying all four areas in company strategy gives competitive advantage because copying them is not easy or quick. The four strategies are: pollution prevention, product stewardship, clean technology and bottom or base of the pyramid (FIGURE 3).



FIGURE 3: Sustainable value -concept modified from Hart and Milstein (2003) and (Hart, n.d.).

Strategies in the framework can be grouped in different ways to construe the model construct. One way is dividing the strategies to the bottom row and upper row strategies (FIGURE 3) i.e. greening and beyond greening strategies. Bottom strategies in turn contribute to creating competitive advantage for today and upper strategies for the future. Specifically, the two strategies at the bottom, pollution prevention and product stewardship, are based on developing existing products and processes which enable the company to realize the changes immediately and create value quickly through improved community relations, legitimacy and brand reputation. Activities at these two areas are already well rooted into multinational companies operations. The two upper strategies, clean technology and base of the pyramid, aim for tomorrow's technology and markets to secure company's future growth and competitive advantage. (Hart, 2007.)

Another division can be made between the left and right column strategies i.e. internal competence development and external stakeholder engagement and their influence on business. The strategies on the left, namely pollution prevention and clean technology, are focusing on developing internal skills, technologies and capabilities, while the strategies on the right feed the firm with the outside stakeholder new perspectives and knowledge. Balancing between these two is important hence being too much on left side may cause myopia as external conditions are ignored. On the other hand, emphasizing too much right column strategies incorporates risk of being accused of "green washing". (Hart, 2007.)

4.2.1 Pollution prevention

Pollution prevention strategy seeks sustainability by minimizing waste and emissions from current facilities. The focus is on the "inner side of the fences" meaning the production site. Company benefits from the strategy are cost and risk reduction. (Hart, 2010.)

The strategy gained popularity in mid-1980's after the dominance of pollution control strategies with end-of-pipe solutions to reduce environmental impacts. It was understood that the pollution is often more effective and less costly to prevent than to clean up afterwards. Reinhardt (1998) suggested, that companies were able to increase the product price or market share more than the environmental improvements in the production processes raised the business' costs. Furthermore, it was noticed that it is possible to save money by preventing pollution through process and product redesign and this has been demonstrated e.g. by King and Lenox (2002). Potential sources for savings can be e.g. reduced inputs, simpler processes and lower compliance and liability costs (Hart & Dowell, 2011). Adopting the approach was accelerated also by market based incentives and by extending quality management to include sustainability issues - International Standardization Organization's (ISO) 14 001 standard for environmental management systems was a key element in the process (Hart, 2010).

One example of a notable governmental action was the US Pollution Prevention Act of 1990 that was passed by the US Congress in 1990. It declared pollution prevention was the national policy and noted that existing regulation in US was one obstacle for pollution prevention at the source because it focused on treatment and disposal instead of the source of pollution. It brought up the hierarchy principle in environmental protection: pollution should be firstly prevented or reduced, secondly recycled, thirdly treated and lastly the option of disposing or releasing it to the environment considered if the earlier options in the presented order were not feasible or environmentally sound. (US Congress, 1990.)

The key stakeholders and implementers of the strategy are employees. The strategy addresses internal capability building in production and operations (Hart, 1995). Hart (2010) propose that successful execution of pollution prevention strategy requires employee involvement, continuous improvement and quality management capabilities.

Although Hart's original concept does not pay special attention to safety issues, they can also be included in a sustainability strategy as well. Moreover, the accident prevention strategies can be seen as parallel to pollution prevention strategies despite the fact that the research on the areas appears clearly separate from each other. Hart (2010) presents that companies following pollution prevention strategy may have ultimate zero pollution goal. The connection between zero pollution and zero accidents goals has been noticed for example by Zwetsloot et al. (2013) who further mention that zero accidents vision is founded on the idea that all accidents can be prevented and the target is aimed with continuous improvement measures. In addition to the close relation to quality management there can be found other similarities with pollution prevention strategy, such as the internal scope, employee involvement and cost reduction (Zwetsloot, et al., 2013). Also the adoption of the approaches has been quite simultaneous, for example British Petroleum (BP) has aimed for zero accident rate in 1990's (Roberts, 1997).

Hart (2010) has classified sustainability buzzwords into the four sustainability strategies. These terms put together describe the content and actions of each strategy and they are used later in this study in the sustainability marketing framework. Buzzwords relating to the pollution prevention strategy are: environmental management systems, greening, pollution prevention (P2), eco-efficiency, risk management,

environmental management, ISO 14001, waste reduction and resource productivity (Hart, 2010, p. 85). Based on the literature review in this study, other keywords that can be added to Hart's list are: end of pipe solutions, simpler processes, employees, continuous improvement, zero pollutant, zero accidents and cost reduction (internal scope).

4.2.2 Product stewardship

Product stewardship strategy looks into whole value chain and applies stakeholder theory (Hart, 1995). Consequently, important development areas are life-cycle management and stakeholder engagement. The focus is on improving existing products and the corporate benefit of this strategy roots from community relations, reputation and legitimacy (Hart, 2010).

Stakeholder approach in the context of product stewardship means interaction with suppliers, customers, regulators, communities, NGOs and the media to consider their perspectives in the business (Hart, 2010). This extends the influence of the company's sustainability measures and creates an opportunity to lower the environmental impacts across the value chain. Stakeholder approach implies that communication should clearly have an important role in implementing product stewardship strategies.

There are several tools used for improving the environmental performance in the value chain and also for communicating it to the stakeholders. It can be said that 1990's was fast development period for the tools. Life cycle assessment (LCA) can be used both as a tool for managing the environmental impacts in value chain and for communicating the performance level to customers as well as to other stakeholders (ISO, 2006). Also tracing systems for the origin of raw material, certified according to the principles of FSC (Forest Stewardship Council) or PEFC (The Programme for the Endorsement of Forest Certification) for instance, work as a tool for sustainability performance improvement and communication. In addition, other kind of monitoring of suppliers and subcontractors environmental and social practices by internal or third-party audits are possible tools for pursuing sustainability in the value chain (Hart, 2010). Moreover, chemical industry has had a widely adopted global voluntary initiative Responsible Care that involves product stewardship as it aims for continuous improvement in health, safety and environmental performance during the chemical life cycle in addition to open and transparent communication to stakeholders among chemical industry (International Council of Chemical Associations, 2013). Considering communications, it should be noted that the sustainability information should be credible and verifiable (Dangelico & Pujari, 2010). There is an ISO framework to guide environmental product labelling used for external communication. According to the framework, labels are divided to self-declared environmental claims (ISO, 1999) and to the certificates, labels and declarations that are based on external verification (ISO, 1999; ISO, 2006).

Economic benefit from sustainable product has been contemplated by Reinhardt (1998). He suggested, that the increase in product price of a sustainable product can be more than the required costs for the sustainability improvement. Furthermore, he noted, that in B2B markets, if a company enables its customers to create savings from environmental costs it is possible to gain a share of it.

Buzzwords describing the contents of the product stewardship strategy include: corporate social responsibility, industrial ecology, stakeholder management, life-cycle management, design for environment (DfE), green design, corporate citizenship, full cost accounting, take-back and transparency (Hart, 2010, p. 85). Additional key elements found in this literature review are: value chain, third party audits, environmental communication (with) certificates, labels, declarations, LCA, FSC, PEFC, Responsible care, NGO, supplier, customer, regulators, communities and media.

4.2.3 Clean technology

Clean technology strategy is based on leapfrog innovations to develop and deploy next-generation clean technologies. Leapfrogging is needed in standard routines and knowledge altogether instead of incremental improvement characteristic to pollution prevention strategies (Hart, 2010). In the future competitive advantage and economic growth are believed to stem from constraints shifting improvements and disruptive technologies that address society's needs (Porter & van der Linde, 1995; Hart, 2010). Such emerging technologies are proposed to include especially great opportunities for repositioning to companies that are heavily dependent upon fossil fuels, natural resources and toxic materials (Hart, 2010).

Hart (2010) includes bio-based polymers in cleantech strategy by giving cleantech example from plastics industry where companies are aiming to develop bio-based polymers to substitute petrochemical inputs with renewable feedstocks. Accordingly, the bio-based products in the scope of this study can be considered as clean technology products.

In addition to its environmental aspects, clean technology as a sustainability strategy seems to be justified already because of the economic advantages. According to the consultation company Roland Berger, global clean technology market has accomplished 11,8% average annual growth since 2007 being worth over 2 trillion euros in 2011 and it is estimated that by 2025 it will more than double to 4,4 trillion (Bücheler, Henzelmann, & Wiedemann, 2012). National figures from Finland for example show that in 2012 clean technology was one of the fastest growing industries with 15 % growth rate (Cleantech Finland, 2013). Small countries and especially Scandinavia are expected lead the clean technology development in future according to the global cleantech innovation index where the top positions were conquered by Denmark, Israel, Sweden and Finland (Knowles, Henningsson, Youngman, & Faulkner, 2011).

Hart (2010) argues that small ventures and Non-Governmental Organizations (NGOs) are responsible for most of the activities in clean technologies and bottom of the pyramid markets. He claims that this is because pursuing these two strategies is disruptive in character and in large companies any innovations that depart too much from the norm are killed by "corporate antibodies". MNCs with demonstrated abilities in acquiring new skills, such as working with unconventional partners, incubating disruptive innovations, shedding obsolete businesses, and creatively destroying existing product portfolios are better positioned to pursue clean technologies (Hart, 2010). There is also another aspect in clean technology and bio-based economy that emphasizes the economics of number instead of economics of scale which is the strength of

MNCs: due to the fact that biomass cannot be transported long distances in a sustainable manner, distributed bio-based economy models are emphasized and considered to be successful. In the distributed bio-based economy model, biomass should be used near the location where it is produced, and the waste streams utilized in the closed-loop ecosystem of different industries in local value networks. (Luoma et al., 2011) According to these views, it seems that large MNC's should carefully consider their traditional modes of operation and their business models to be agile enough and successful in bio-based products field of clean technology.

Sustainability buzzwords related to clean technology strategy are: eco-effectiveness, biomimicry, leapfrog technology, sustainable technology, knowledge and service intensity, cradle to cradle, closed loops, restorative technology and systems thinking (Hart, 2010). Additional key elements found in this literature review are: society needs, repositioning, bio-based to substitute petrochemical inputs, renewable feedstocks, growth businesses, small venture activities, NGO activities, new skills acquisitions, unconventional partners, creative destruction of old product portfolios and distributed production.

4.2.4 Base of the pyramid

Base of the pyramid (BoP) strategy is about co-creating new businesses to serve the unmet needs of the poor and underserved. It offers an opportunity of a new growth path and trajectory for companies (Hart, 2010). Hart and Christensen (2002) claim there are two reasons why the base of the pyramid is the ideal market for new disruptive technologies. First, market models designed for the poor can work in larger markets than the models designed to serve high-income markets. Second, base of the pyramid markets are underserved. On the other hand, it is also noted that to be able to do business with the world's poorest people in first place, it requires radical innovations both in technology and business models (Prahalad & Hart, 2002).

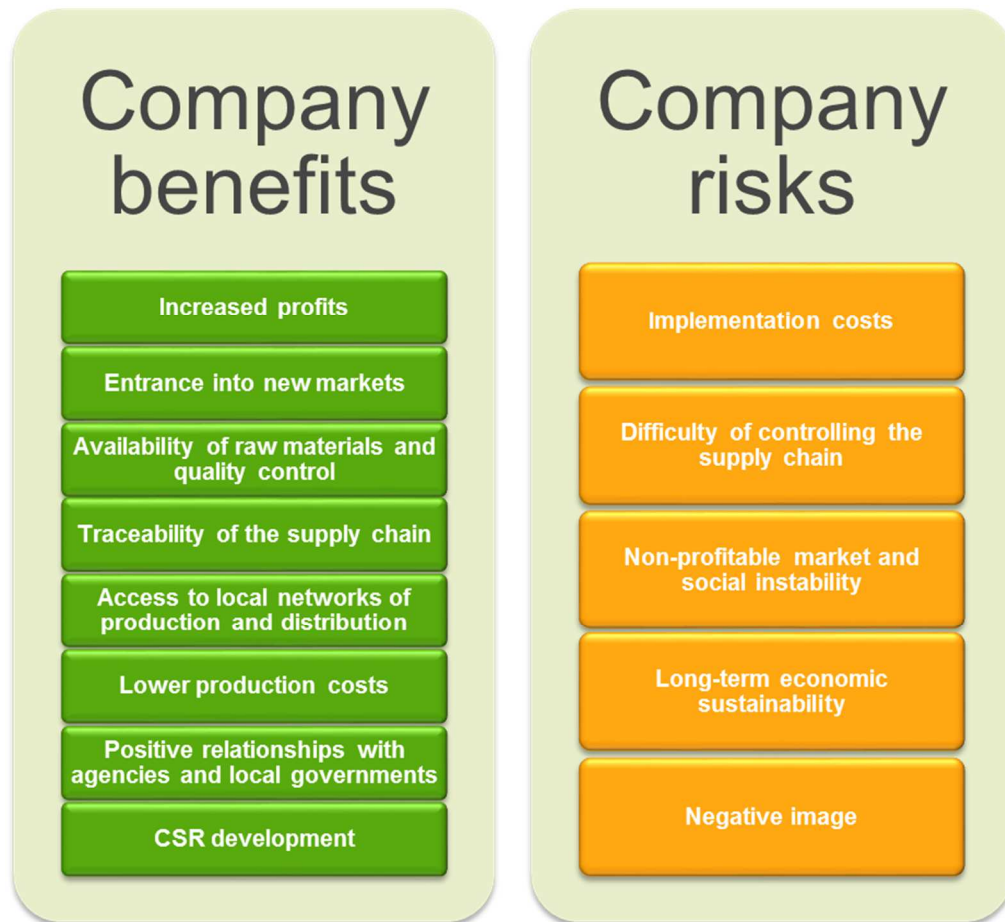
Hart (2010) suggests that by concentrating on emerging markets companies can both create growth and satisfy social and environmental stakeholders. There are different figures given to define the BoP market incomes. Prahalad and Hart (2002) describe BoP markets with annual per capita income less than \$1500 which is the minimum considered necessary to sustain a decent life, and over a billion people live with income less than \$1 per day (Prahalad & Hart, 2002). Hammond et al. (2007) in turn consider BoP markets those with annual incomes below \$3000 in local purchasing power.

Although the available cash is extremely limited among poor individuals, the amount of people is vast which creates high value markets. Prahalad's (2004) estimate of multitrillion dollar BoP markets was challenged by Karnani (2007) who critically estimated the size of markets at only US\$0,3 trillion. World Resource Institute (WRI) published later a detailed study on the BoP market composition and size. The WRI report presented that 72 % of the 5 575 million people recorded by national household surveys are considered to belong to BoP which lead an to estimate of \$5 trillion markets worldwide (Hammond, Kramer, Katz, Tran, & Walker, 2007). The figure was given as international dollars expressing the purchasing power parity. In US dollars

this figure of BoP market estimation is US\$1,3 trillion. Hammond et al. (2007) have illustrated the sizes of the different BoP market sector and revealed that the largest single market sectors are food, energy and housing. They also found that geographically BoP markets are located in Asia, Latin America, Africa and Eastern Europe. Additionally, poor areas in developed countries can be seen as an extension of traditional BoP strategy. For example Porter and Kramer (2011) juxtapose poor urban areas in America with BoP markets as an underserved market whose purchasing power has been over looked.

To clarify the BoP strategy particularly in sustainable value -concept some key elements are reviewed here. Literature describes several business models in BoP markets to create value for the community. Micheline and Fiorentino (2012) compared two for-profit company business models, the social business model and the inclusive business model with a case study design. They found difference between business models in the division of profits. The social business type returns profits as the capital to investors or it is invested in social business again, but not distributed to shareholders. In inclusive model the profits are managed traditionally. Another important distinction they noted was that in the social business the product features and are lowered from traditional value proposition i.e. the target is to create prosperity by offering cheap products to BoP markets, but in the inclusive business model the shared value is emerging from the value chain functions. Third descriptive difference is that social business is typically a joint venture with non-profit organization whereas inclusive businesses are spin-off businesses where the company is the promoter alone. Micheline and Fiorentino (2012) find that both types of businesses create shared value. Both are also included in sustainable value concept (Hart, 2010). Though the social business can help companies to gain competitive advantage for example by acquiring of new skills, it seems that inclusive business model would be the overall aim of sustainable value concept because it benefits also the company shareholders by increased profits. As Hart (2010) defines, creating shareholder wealth that simultaneously drives toward a more sustainable world creates sustainable value. Other benefits of inclusive business model include as entrance into new markets, availability of new raw materials (Halme & Laurila, 2009), traceability of the supply chain, access to local networks of production and distribution whereas risks include implementation costs and difficulty of controlling the supply chain (Micheline & Fiorentino, 2012) (TABLE 3).

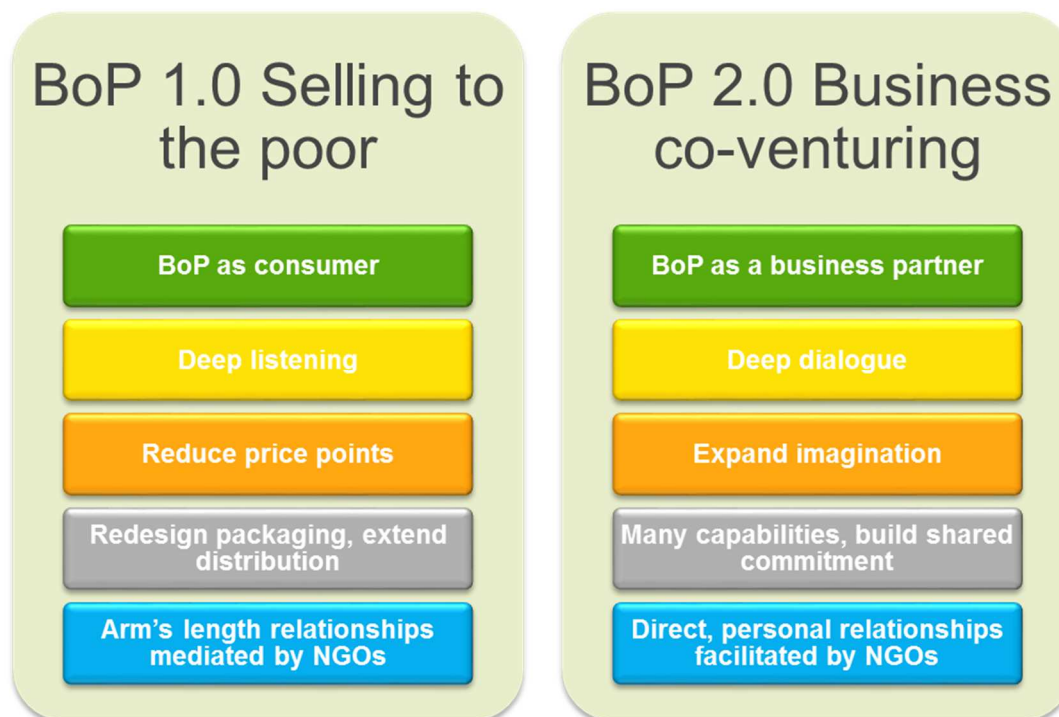
TABLE 3 Benefits and risks of inclusive business model. Adapted from Michelini and Fiorentino (2012).



It is still unclear what actions and linkages to other actors are needed to gain legitimacy for company operations in a BoP market environment (Hart & Dowell, 2011), but the overall importance of collaboration is frequently stated in BoP literature. While propriety technology and legal contracts are important on developed markets, are social capital and trust mentioned as the key elements of BoP market business models and competitive advantage (Hart & Dowell, 2011). It has been suggested to be able to build the business companies need wide range of stakeholders such as local governmental authorities, NGOs, communities, financial institutions (Prahalad & Hart, 2002; Michelini & Fiorentino, 2012). Also previously overlooked stakeholders such as shantytown dwellers or rural poor can help in business creation. There exist active networks for sharing knowledge and developing BoP businesses e.g. BoP Global Network. Building local clusters contributes the formation of open and transparent markets and strengthens the connection between the success of the company and the success of the community (Porter & Kramer, 2011).

When first introducing BoP, Prahalad and Hart (2002) called MNC's for help the poor people to improve their lives by selling sustainable products to them. The message of sustainable BoP strategy has evolved since and it has been stated the aim is not only to sell to the poor but to co-create businesses in conjunction with BoP communities and create mutual value (Hart, 2007). Table 4 lists the differences of the two approaches referred as BoP 1.0 and BoP 2.0 (Simanis & Hart, 2008).

TABLE 4 Differences between BoP 1.0 and BoP 2.0 strategies. Adapted from Simanis and Hart (2008).



More inclusive capitalism is needed for practicing BoP 2.0 than BoP 1.0 and it requires capacity building from companies instead of low cost production and also processes instead of just extended distribution (Hart & Dowell, 2011). Furthermore, firms need to transform their mindset from large scale centralized operations to highly distributed small-scale operations married to world-scale capabilities (Prahalad & Hart, 2002). In BoP markets the unit sales are high and capital efficiency is high, but margins are often low (Hart, 2010).

There are additional special features in BoP markets. Because the consumers in BoP are limited with cash, single-serve packages for example in personal care products and other consumables are popular (Prahalad & Hart, 2002). Another characteristic feature is that the rural poor are often difficult to reach and therefore innovative distribution models are needed (Michellini & Fiorentino, 2012; Hart, 2010; Porter & Kramer, 2011).

As the developing countries and BoP markets differ from developed countries and their ordinary markets, there are also different responsibilities for companies to consider ensuring sustainability of the business and not causing more problems to the poor at the base of the pyramid. Ethical questions in marketing, such as which products, on what price and how to promote at the base of the pyramid are necessary to solve in a responsible way (Davidson, 2009).

Buzzwords related to BoP strategy: sustainable development, base of the pyramid, urban reinvestment, brownfield redevelopment, inclusive capitalism, pro-poor business, social entrepreneurship, radical transactiveness, B24B (Hart, 2010). Addi-

tional key elements found in this literature review are: Disruptive technologies, disruptive business models, inclusive business models, emerging markets, social capital and trust, rural poor, living laboratories, highly distributed small-scale operations, innovative distribution models, local clusters, ethical marketing, local governmental authorities, NGOs, communities and financial institutions.

5 MARKETING STRATEGIES - HOW TO SHARE VALUE?

Marketing strategy is one of the functional strategies in a company. It should reflect the overall corporate strategy, objectives, vision, mission and values (Belz & Peattie, 2009). Whereas the corporate sustainability strategy was earlier claimed to follow the business strategy, the same logic is pursued here in sustainability marketing strategy and marketing strategy: sustainability marketing strategy should not be considered as separate from core marketing activities. Essentially, sustainability marketing is about incorporating the environmental and social sustainability components in to marketing activities. This section defines the marketing terms and approach used in the framework to observe different sustainability strategies from marketing perspective.

5.1 Defining marketing and marketing strategy

One commonly used definition for the term marketing is from American Marketing Association (2007):

“Marketing is the activity, set of institutions, and processes for creating, communicating, delivering and exchanging offerings that have value for consumers, clients, partners, and society at large” (American Marketing Association, 2007).

Interestingly, is that it is a quick revision of the earlier definition that was published by the same organization in 2004:

“Marketing is an organizational function and a set of processes for creating, communicating, and delivering value to customers and for managing customer relationships in ways that benefit the organization and its stakeholders.” (American Marketing Association, 2004).

There were two notable changes in the newer version compared to the older one. Firstly, according to the current definition, it is not just the persons working at the marketing department that should be involved with marketing issues. The more recent definition describes marketing as an activity instead of function, which emphasizes its purpose as broader activity and not just as a separate department in an organization. Similar approach has been proposed already in the beginning or 1990's in the context of marketing concept named market orientation (Kohli & Jaworski, 1990).

Secondly, contemporary marketing involves also other stakeholders besides customers. Newer definition mentions several stakeholders separately and takes them to the same level with customers by saying that the offerings should have value for all of them. Although many marketing scholars concentrate on the interaction between the firm and its customers or at the most add competitors to the scope (Narver & Slater, 1990; Kohli & Jaworski, 1990) there seems to be increasing interest towards other stakeholders in marketing research. Papers considering market orientation (Tomas & Hult, 2011; Cronin et al., 2011; Mitchell et al., 2010; Crittenden et al., 2011) have echoed the message about including broad range of stakeholders to marketing scope and discuss about sustainability market orientation that applies the stakeholder theory

(Freeman R. , 1984). Interesting with regard to this study is also that the revised part of the definition: “value for ... society at large” is echoing the sustainability strategy frameworks from Hart & Dowell (2011) and Porter & Kramer (2011).

While marketing itself has broadly accepted the definition, there is no such universal definition for the term marketing strategy. However, several scholars have made their effort to clarify its contents. Varadarajan (2010, p. 128) has reviewed literature with distinction and synthesized following definition for marketing strategy as an organizational strategy construct:

“Marketing strategy refers to an organization’s integrated pattern of decisions that specify its crucial choices concerning markets to serve and market segments to target, marketing activities to perform and the manner of performance of these activities, and the allocation of marketing resources among markets, market segments and marketing activities toward the creation, communication and/or delivery of a product that offers value to customers in exchanges with the organization and thereby enables the organization to achieve specific objectives.”

Varadarajan’s definition is quite detailed but has broad scope and it captures most areas of strategic marketing decisions, and compared to for example to Morgan’s (2012) review, it only lacks decision about timing. However, Varadarajan’s definition concentrates on the interaction between the organization and its customers ignoring other stakeholders, though it does not align with the spirit of new definition of marketing. The definition by Hollensen (2010) is on more general level but it can be interpret to include more stakeholders in addition to customers and competitors as “other environmental factors”.

“A marketing strategy is a fundamental pattern of present and planned objectives, resource deployments, and interactions of an organization with markets, competitors and other environmental factors” (Hollensen, 2010, p. 2).

Based on Kotler and Keller’s (2016) marketing course book, to gain high company profitability marketing strategy should be built on target marketing, STP-model, segmentation, targeting and positioning. In market segmentation distinct buyer groups are identified and profiled according to their needs and wants. In market targeting the segments are evaluated based on their overall attractiveness and the company’s objectives and resources. Based on the evaluation company selects one or more target segments to enter. In market positioning company’s offerings are positioned in the buyers minds so that target market recognizes its distinctive offerings and images. As a result, target marketing helps the company to focus its marketing efforts on the customers it can satisfy in a superior way by delivering high customer value and satisfaction. This is to lead to high repeat purchases and ultimately to high company profitability. (Kotler and Keller, 2016.)

In this study marketing strategy is seen as an upper level set of decisions that define the direction, targets and resources for marketing. These decisions include the aspects of stakeholder interaction and also such decisions as whether or not to use sustainability in market positioning.

5.2 Key considerations for business-to-business marketing

Business markets are highly competitive. Hence, differentiation is critical in business marketing to prevent commoditization that decreases margins and weakens customer loyalty. Products can be differentiated in form, features, performance quality, conformance quality, durability, reliability, reparability, style and customization. If the physical product differentiation is difficult, it is possible to add services and improve their quality. The main service differentiators are ordering ease, delivery, installation, customer training, customer consulting, maintenance and repair, returns. (Kotler & Keller, 2016.)

In business markets there are similarities but also sharp contrasts with consumer markets. In the context of sustainability marketing, derived demand of business goods and services is a noteworthy difference. The demand is ultimately derived from the demand for consumer goods, so the buying patterns of end users need to be followed. Differences include also smaller customer base, closer supplier-customer relationships and professional purchasing. (Kotler & Keller, 2016).

When new product or service is bought for the first time, the business buying process includes several stages: awareness, interest, evaluation, trial and adoption. Different kind of communication routes are often important on different stages, for example, awareness can be gained by mass media, salespeople have greatest impact at the interest stage and technical sources may be most important during evaluation phase. Online selling can be applicable at all stages. It is worth remembering that it is individuals who are making the buying decisions. They are buying solutions to the organization's economic and strategic problem as well as their own personal need for achievement and reward. (Kotler & Keller, 2016.)

5.3 Implementing marketing strategy

Marketing plan is more concrete and detailed than marketing strategy (Morgan, 2012). It describes the marketing activities in order to achieve the objectives defined in the strategy (Hollensen, 2010). The 4 Ps standing for marketing mix constituents - product, place, price and promotion - are seen as a part of a marketing plan (Kotler & Keller, 2016).

TABLE 5 The four components of traditional marketing mix. Adapted from Kotler & Keller (2016, p. 47).

MARKETING MIX – 4 P			
PRODUCT	PRICE	PROMOTION	PLACE
<ul style="list-style-type: none"> • Product variety • Quality • Design • Features • Brand name • Packaging • Sizes • Services • Warranties • Returns 	<ul style="list-style-type: none"> • List price • Discounts • Allowances • Payment period • Credit terms 	<ul style="list-style-type: none"> • Sales promotion • Advertising • Sales force • Public relations • Direct marketing 	<ul style="list-style-type: none"> • Channels • Coverage • Assortments • Locations • Inventory • Transport

Although the 4Ps approach has been successful already since 1960's (Grönroos, 1994), and is still widely used, the marketing mix concept has also been revised and criticized. Review of the topic is presented for example by Goi (2009). From the sustainability point of view, Kotler (2011) has raised the need for revising marketing practices to take into account the environmental aspects. Critical viewpoint towards basic marketing mix is presented by Ottman et al. (2006) who argue that 4P's concept emphasizes company view and concentrates on the product and purchases and thus possesses a risk to marketing myopia. Marketing myopia means focusing the products or services instead of customer solutions and green marketing myopia occurs if the environmental quality is overemphasized in the expense of customer satisfaction (Ottman, Stafford, & Hartman, 2006). An often used example of marketing myopia is the case of the US railways – they had great times in the nineteenth century as that time no other transportation mode could compete with the railroads. As other forms of transportation developed, cars and airplanes, many railroad companies went bankrupt because they concentrated on their business on railroads instead of providing transport and mobility to customers (Belz & Peattie, 2009).

Relationship marketing concept has gained increasing popularity after mass markets have turned to matured markets (Hollensen, 2010). In 1990's relationship marketing was regarded as the new marketing paradigm (Grönroos, 1994). Relationship marketing is based on ongoing collaboration between suppliers and selected customers for mutual value creation and sharing (Gordon, 1998). In business-to-business (B2B) markets where there is a limited number of customers and direct interaction with them is it relatively easy to adopt relationship marketing approach and it can also be seen as a more appropriate approach compared to 4Ps. However, most companies are practicing their marketing with a mixture of both approaches e.g. by identifying marketing instruments with 4P framework for building and maintaining good relationships with the customers. (Hollensen, 2010.)

Achrol and Kotler (2012) state in their paper that marketing is standing at the threshold of a network paradigm. Seemingly one main trend in marketing is the widening of the marketing perspective in two ways: involving more participants to the marketing process inside the organization and targeting with marketing to new external groups. In practice this means inter-functional activity inside the organization, wider stakeholder involvement and creating value also for other stakeholders besides customers as stated in the definition for marketing. With regards of this study, it was indicated first by the latest definition for marketing from the American Marketing Association, second by the emergence of sustainability market orientation and third by the trend in marketing concept change from traditional transactional marketing to relationship and further network marketing.

Achrol and Kotler (2012) further contemplate the emerging marketing paradigm from other angles and, interestingly, the connection to contemporary sustainability strategies can be detected. In their paper, the same issues are becoming prominent as the key assumptions of emerging marketing paradigm that are also the essential elements of sustainability strategies. These include proactive strategies in ecology and development instead of reactive CSR, growth from lower middle and base of the pyramid markets, small-scale distributed production-consumption networks, co-creation, co-production, new forms of capitalism as followers of laissez-faire capitalism: self-regulated capitalism, conscientious capitalism, conscious capitalism, and social capitalism. They have set sustainability and poverty as one of the three dimensions in their forward-looking conceptual framework for marketing.

As a conclusion of the essential elements of marketing regarding this study, the key characteristics of marketing strategy are the decisions about marketing objectives, markets, marketing activities, resource allocations and timing. Furthermore, the implementation of a marketing strategy is often combining 4Ps with stakeholder relationship building and maintaining, because effective product positioning, i.e. relative superiority compared to competitors on one or more components of the 4P, is a source of competitive advantage. On the other hand creativity as well as long-term and close relationships also provide differentiation and thus a source competitive advantage (Hollensen, 2010). That is why both 4Ps and the collaboration with variety stakeholders are important part of marketing strategy implementation and they are used later in the sustainability marketing framework to analyse companies' sustainability strategies. Noteworthy is also that the contents of sustainability strategies in the core of this study are considered as one key dimension of the emerging marketing paradigm which indicates growing interest in the marketing approach used in this study.

6 CONCLUSIONS FROM THE LITERATURE AND THE CONCEPTUAL FRAMEWORK FOR SUSTAINABILITY MARKETING

The objective of the literature review was to support two of the study objectives: To introduce the bio-based products and to develop an integrated conceptual framework and simultaneously provide insight into managing the sustainability marketing by synthesizing some of the theories available in strategic management with insights available in the sustainability strategy and marketing literature. While the insights were provided in the literature review, findings of the literature are presented in this chapter. Furthermore, the conceptual framework with descriptive categories is presented below.

Business strategy concepts are used for guiding the means to achieve competitive advantage. In this study the relationship between all strategies including corporate strategy, business strategy, sustainability and marketing strategies and further sustainability marketing strategy is seen interactive. Sustainability strategies of the companies seeking future success should include aspects from innovative sustainability strategy approach which requires the company to extend the core business or create new businesses to generate mitigating solutions to environmental and social problems. This means that the sustainability issues should be looked through the same strategy lenses as the overall business strategy. Furthermore, sustainability marketing here is understood as application of corporate sustainability strategy in marketing strategy and practice.

The framework developed for analysing sustainability marketing in this study combines a corporate sustainability strategy framework, sustainable value, with traditional marketing mix 4Ps and an additional fifth P, standing for partners (TABLE 6). The main aim set for this work was to describe successful sustainability marketing strategy factors for bio-based materials and chemicals businesses to gain competitive advantage. As the focus was in products (bio-based products), it was considered valuable to focus on examining the expression of corporate sustainability strategy from product marketing approach.

The sustainability framework is based on sustainable value concept that aligns with contemporary business strategy concepts (Hart & Milstein, 2003; Hart, 2007; Hart & Dowell, 2011). The four sustainability strategies, although representing the front-runner strategies from different decades as such, should be balanced in the corporate strategy portfolio in order to provide competitive advantage.

	Pollution Prevention	Product Stewardship	Clean technology	Base of the pyramid
Product		<ul style="list-style-type: none"> Life-cycle management Green design Design for environment Full cost accounting 	<ul style="list-style-type: none"> Eco-effectiveness Biomimicry Leapfrog technology Sustainable technology Knowledge and service intensity Cradle to cradle Restorative technology Systems thinking Creative destruction of old product portfolios Renewable feedstocks Closed loops 	<ul style="list-style-type: none"> Disruptive technologies
Price	<ul style="list-style-type: none"> Higher or same 	<ul style="list-style-type: none"> B2B Higher purchasing cost but savings in overall cost B2C Higher or the same purchasing and overall cost 	<ul style="list-style-type: none"> Same or lower 	<ul style="list-style-type: none"> Same or lower
Place	<ul style="list-style-type: none"> Pollution prevention (P2) Waste reduction Env. management systems Eco-efficiency Risk management Resource productivity End of pipe solutions Zero pollutants and accidents Continuous improvement 	<ul style="list-style-type: none"> Take-back Industrial ecology Responsible care 	<ul style="list-style-type: none"> Small-scale distributed production near biomass 	<ul style="list-style-type: none"> B24B Base of the pyramid Pro-poor business Brownfield redevelopment Small-scale distributed production Close to the consumption
Promotion	<ul style="list-style-type: none"> ISO 14001 Greening 	<ul style="list-style-type: none"> Transparency CSR Full cost accounting LCA Footprints Product labels Product declarations 3rd party audited data Corporate citizenship 	<ul style="list-style-type: none"> Repositioning 	<ul style="list-style-type: none"> Ethical marketing
Partnering	<ul style="list-style-type: none"> Extensive employee involvement 	<ul style="list-style-type: none"> Stakeholder management NGO Suppliers Customers Regulators Communities Media Value chain 	<ul style="list-style-type: none"> Unconventional partners Society needs 	<ul style="list-style-type: none"> Base of the pyramid (Rural) poor NGO Financial institutions Communities Local clusters Local Governmental authorities Radical transactiveness

TABLE 6 Conceptual framework for sustainability marketing.

Evaluating and observing the marketing strategy from the outside of the company can be done through its implementation i.e. marketing plan and in practice 4Ps are the parts that can be, to some extent, observed also without internal information. That was one reason why marketing mix was included to the framework. In the framework 4Ps are understood broadly like in Kotler's (2011) review. *Product* is understood as product features and as product design activities behind the features. *Price* signifies setting the price level for the products in different strategies. *Place* is understood as distribution which in turn includes the value chain from the production site. Additionally, sustainability management system issues were positioned under place because the certificate is given to a site, not to a product. However, many other certificates are product dependent and are also used for communication. Therefore it is not self-evident, how the elements are categorized and same elements can belong in several categories. Another option for contemplating management issues could have been product aspect, but it was wanted in this study to emphasize the shift from production focus of pollution prevention strategies to product focus of product stewardship strategies. *Promotion* includes communication aspects, not just advertising. The additional fifth P, *partner*, refers widely to all stakeholders including both market and non-market representatives. The need for adding partners to the framework was seen inevitable because stakeholder engagement is a key part of contemporary marketing approach in relationship marketing and market orientation.

The support for this sustainability marketing approach was found from the business strategy, sustainability strategy as well as marketing strategy research as the contemporary themes - disruptive innovations, blue oceans, sustainable value including clean technology and pro-poor strategies together with the emerging paradigm shift in marketing - seem to be all repeated and intertwined among the three strategy fields.

7 RESEARCH METHODS

This research follows the case study approach. Case studies typically give in-depth understanding of one or more cases (Yin, 2003; Kananen, 2013). Research questions in case studies are often formatted as how and why questions, but in descriptive research also what is commonly used (Kananen, 2013). Yin (2003) argues that a case study should examine a contemporary phenomenon in its natural context. Among these critical features of case studies Kananen (2013) presents multi-method approach and multidimensional research problems as most apparent characteristics of case studies. Based on the notions of Yin (2003) and Kananen (2013) it was evident that the case study approach was a proper research strategy to serve the aims and objectives of this study and to answer to the research questions presented in Chapter 1.3. Moreover, it is advised by Yin (2003) to prefer a multiple case study designs over single cases because they are less vulnerable and provide analytic benefits and therefore are more likely to provide successful outcome. For given reasoning, multiple case study was selected for the research strategy. The use of multiple case study and furthermore, applying literal replication logic in case selection, was aimed to increase the external validity of the study.

In order to identify successful sustainability marketing strategy elements suitable for bio-based chemicals and materials, three case studies were conducted. The empirical part was based on the multiple case model and a single company was treated as the unit of analysis. The research is mainly descriptive but it has explorative characteristics as well. Finally, it should be noted that case studies can be used for analytic generalization, but not for statistical generalization to populations (Yin, 2003).

7.1 Data collection

Empirical part involved two data gathering methods: interviews and documents. Construct validity was aimed with data triangulation, meaning multiple source of data that could be used as sources of evidence converging on the same findings (Yin 2014). For the sake of reliability the interviews were carefully documented, and key documents were achieved in case study database,

Research questions and the conceptual framework guided the data gathering in both interviews and from document sources. The study was planned so that these two data gathering methods were overlapping and partly complementing each other. For example, any information about pricing is rarely found from company web pages, but some overall pricing principles can be given in interviews. On the other hand, company web pages and annual reports are one way to communicate about the products and company so part of the actual communication material is readily available online. In general, it was expected that company web pages give more exact figures and information and in interviews there is possible to get explanations for the back-

grounds of the publicly provided information. It was seen that these methods are supporting each other and serve the research aims well which is important to take into account when selecting the methods.

7.1.1 Interviews

The first set of the data was collected from chemical industry companies by semi-structured individual telephone interviews. Interview is a frequently used method for gathering data from previously poorly known research area and it is often used for gaining deeper understanding and explanations for the gathered information, specifically in case studies (Hirsjärvi, Remes, & Sajavaara, 1997). In this study semi-structured construction was chosen also because the interviews were wanted to be executed in a relatively short period of time to gain better response rate for research invitations. It was assumed that the semi-structured format gives pace for the interview compared to an open interview or closely related theme interview. On the other hand, semi-structured interview still allows rephrasing and more specific questions that may rise during conversation (Ayres, 2012). One challenge of semi-structured interviews is to create open and confidential atmosphere to the interview and assuring all themes are handled in the discussion while not interfering too much to the answers of the interviewees by accompanying, for example (Kananen 2013).

Interview process was executed as follows:

1. Theme selection
2. Theme framework and supporting questions
3. Professional review of the interview questions
4. Modifying the question
5. Interviews
6. Transcription
7. Analysis
8. Reporting

The main interview questions were composed to guide the interview and to ensure that the relevant areas of the research framework were covered in the discussions. Interviews were constructed under three topics: product, marketing and collaboration. Interviewees were informed already in the e-mail invitation about the background of the study, preliminary research questions, the focus area and time frame. When agreed to take part to the interview, they were provided the themes and main supporting questions.

It is recommended to conduct test interviews to test the question setting and time requirements (Hirsjärvi, Remes, & Sajavaara, 1997). However, in this study the test interviews were replaced by professional reviews. Themes and supporting questions were reviewed by three professionals from bio-based chemicals and materials business area to give outside view of the suitability of question settings and used phrasings. Some modifications to the questions were done according to the comments from reviewers before starting the research interviews. This was seen as a satisfactory level

of familiarization and feedback. The interviewer was also familiar with most of the professional vocabulary of the research area due to earlier experience.

Telephone interviews were conducted during January-March 2013 and duration of each discussion was approximately from 40 to 50 minutes. Interviews were recorded with the interviewee's permission by mobile phone recorder to collect all the data in a reliable way. Word to word transcribe without additional information about tone or pauses in the speech, was done as soon as possible to control the quality of data handling. In practice this was done during the following two weeks after each interview.

7.1.2 Documents

The second set of data was derived from case company documents from the Internet, and it was limited to the data available on company web pages. The base for the analysis were the annual reports 2015 on economic environmental and social performance. Also annual reports 2014 were used for finding some selected data to indicate the direction of development. The reliability of the data in annual reports was considered good as it they were based on internally verified data and at least partially third party audited.

Company web pages were mainly used as data source in 2013 and 2016. The web pages were revisited also on 2018 to repeat search with relevant terms to the study and to check some individual details related to the earlier observations. On the web pages the research concentrated, but was not limited, on the content that was located under sustainability section as the amount of available information at every company web-pages was vast. The search function was used at the company web pages to find specific information. Examples of used search words were 'bio-based', 'renewable' and 'base of the pyramid'.

7.2 Data analysing methods

This study applied the general case study analysis strategies and techniques presented by Yin (2014). Analysis strategy in the study is relying on the research questions and the conceptual framework (TABLE 6). The conceptual framework could be applied as descriptive framework which helped to organize the data analysis and in developing the case description. It also provided the predicted patterns for pattern matching. Pattern matching is one of the most desirable techniques to use for case study analysis and the internal validity of a study increases if the empirical and predicted patterns appear to be similar (Yin, 2014). Pattern matching was applied in this study together with cross-case synthesis. Instead of hypothesis or propositions, was conceptual framework used for predicting patterns. Analysis methods were qualitative. (Yin, 2014).

Interview transcriptions and summary documents from document sources were coded according to the key words inside the conceptual framework and other codes emerging from the data. After that, coded data was organized based on the left side

of the table 6 (product, price, place, promotion and partnering). An additional category emerging from the data, corporate sustainability strategy, was added during the analysis. This category included the findings that seemed to support and helped understanding the corporate sustainability marketing choices, but was not directly related to marketing or marketing-mix. Then the data under the established categories was grouped according four strategies of sustainable value concept: pollution prevention, product stewardship, clean technology and the base of the pyramid. Document sources were revisited during the analysis and reporting phase to complement the data. Analysis and reporting included also comparing existing literature to address the rival explanations and to find similarities with earlier studies.

7.3 Case and interviewee selection

Yin (2014) claims, that when multiple case design is used it must follow replication instead of sampling logic. He clarifies, that the cases must be selected carefully and predict either similar (literal replication) or contrasting (theoretical replication) results for predictable reasons. All participant companies belonged to European sustainability leaders in chemical industry. They were selected among DJSI (world) 2012 components (RobecoSAM, 2013) and therefore represented literal replication.

It can be questioned whether the companies included in DJSI are the most sustainable (Chelli & Gendron, 2013). However, for the purposes of this study using DJSI as an indicator for sustainability performance was seen as adequate because there was no need to find the absolutely best companies but the ones that are performing exceptionally well in the three sustainability areas.

The selection of the companies from the DJSI was done in two stages. At the first stage two selection criteria were used: sector and country, namely, chemical industry and European countries. At the second stage five companies that best represented the producers of bio-based chemicals and materials were selected. This was targeted by screening the product portfolio of the first stage companies from their web pages and selecting the most suitable ones according to that data.

The companies selected to the research were AkzoNobel and DSM from the Netherlands, and BASF, Bayer and Lanxess from Germany. All five were invited to the telephone interview, but only three companies – AkzoNobel, DSM and BASF – responded and took part to the interview. For this reason the research was finally conducted with only three companies.

Replication approach was used also for selecting the interviewees inside the case companies, as recommended by Pauwels and Matthyssens (2004). Companies were first contacted by e-mail. The contact information was found from company web pages or through researcher's contact network (interviewer didn't know any of the interviewees personally beforehand). The selection of the persons interviewed inside companies was aiming to find persons who firstly, represent a business unit or function that is compatible with the bio-based products context, and secondly, are knowledgeable on sustainability and marketing issues. This proved to be a challenging task to be done from the outside of the company and without knowing the organizations.

Besides all company representatives were not eager to give the telephone interviews so the first choice was not always reached. Titles of the three interviewees were: head of global new business development biodegradable polymers, project director bio-based chemicals & materials and project manager research, development and innovation in bio-based products and services.

8 RESULTS AND DISCUSSION

This chapter presents and discusses the cases in a cross-case analysis format (Yin, 2014). It describes and synthesizes the lessons from all cases and under each topic appropriate examples are given, but none of the cases are presented as a single case study. First, a short introduction to the case companies is given. Then an overview of companies' sustainability strategies is provided by describing how they approach sustainability on corporate level and aim to create value from it. After that, further details of the sustainability strategy portfolios and their expression in marketing mix are described. This chapter provides the details for research questions 2 and 3 whereas the compact answers, the final synthesis, are given later in the conclusions part.

8.1 Introducing the case companies

Five European companies representing the sustainability leaders in chemical industry were selected and invited to the study. Three of them answered and were included in the study: BASF from Germany, AkzoNobel and DSM from the Netherlands. All companies are large, BASF being the largest, AkzoNobel second and DSM smallest of the three companies (FIGURE 4). They operate partly on same businesses and are mentioned as key competitors for each other (BASF, 2016).

In 2015 BASF, DSM and AkzoNobel were included in the DJSI (world) as they were every year since 2001, 2004 and 2006, respectively. AkzoNobel was named as leader of the DJSI materials group in 2015 for fourth year in the row.

BASF	AkzoNobel	DSM
Sales revenue 70 000 million €	Revenue 14 900 million €	Net sales 7 700 million €
Employees 112 000	Employees 45 600	Employees 20 750
Business segments: <ul style="list-style-type: none"> • Chemicals • Performance products • Functional materials and solutions • Agricultural solutions • Oil & gas 	Business areas: <ul style="list-style-type: none"> • Decorative paints • Performance coatings • Specialty chemicals 	Business groups: <ul style="list-style-type: none"> • Nutrition • Materials • Innovation center

FIGURE 4 Case company figures (AkzoNobel, 2016; BASF, 2016; DSM 2016).

8.2 Corporate strategies create value from sustainability

Case companies' strategies reflected sustainability as a key driver of value. Sustainability was seen as a source of competitive advantage in chemical industry through both cost advantage and differentiation.

"Sustainability is a key differentiator and a driver of value in DSM's markets." (DSM, 2016, p. 15)

"The target product (algae-derived oils) is designed to have improved functional and environmental performance, as well as a lower overall cost to AkzoNobel" (AkzoNobel, 2016)

"That is why sustainability and innovation are becoming significant drivers for our profitable growth." (BASF, 2016, p. 25)

Companies had identified global megatrends affecting on their businesses: climate and energy, population growth, new middle class, urbanization, global shifts and digitization, health and wellness. They had designed strategies and provide solutions that address these trends and enable business growth. Hence, it's natural that sustainability was the key theme repeated in the corporate strategies in addition to two other themes, business growth and customer focus. Two companies stated sustainability in company purpose (BASF) or in strategy aim (DSM)

"We create chemistry for a sustainable future" (BASF, 2016, p. 26)

"Driving profitable growth through science-based sustainable solutions" (DSM, 2016, p. 17)

Two companies (BASF and AkzoNobel) mentioned sustainability as one of their strategic focus areas in annual reports while the third company (DSM) didn't name such focus areas at all. These statements showed the strategic importance of sustainability for all three companies.

It was found that bio-based materials were seen as strategically important sustainability topic and as a source of competitive advantage. First, this was shown in the materiality analysis that companies had taken to identify and prioritize relevant sustainability topics (FIGURE 5). According to the materiality matrices all companies had energy issues in top three topics and they mentioned bio-based materials or bio-based economy as a separate topic in the matrix or in the matrix analysis background information. Besides reporting purposes the materiality analysis result was used as a strategy development and implementation tool e.g. in steering processes, in defining strategic focus areas, core principles and sustainability goals. Second, the interviews supported and clarified this finding. Interviewees experienced the company strategy as a key driver for using or changing to sustainable bio-based raw materials. Two interviewees mentioned cost reasons as a driver for developing the bio-based materials and using them in the future. It was believed that fossil oil prices will rise and therefore these chemical companies want to decrease their dependency on fossil materials (AkzoNobel, DSM). They believed that bio-based raw materials will give cost advantage and more stable raw material prices in future. Customer demand was seen as a driver for bio-based materials by two respondents. Customer demand for sustainability (BASF, AkzoNobel), especially in consumer products, was mentioned as a driver

by two company representatives. According to one interviewee, customers consider bio-based products often as more sustainable than standard products with fossil origin. One interviewee mentioned an example from their customer industry, automotive industry, where some companies have own high targets for using bio-based products in automotive interiors and such.

BASF	AkzoNobel	DSM
<ol style="list-style-type: none"> 1. Energy consumption and efficiency 2. Water pollution 3. Resource scarcity <p>Renewable bio based materials were in the middle of the matrix scale</p>	<ol style="list-style-type: none"> 1. People and process safety 2. Energy, resource use, carbon emissions through the value chains (includes bio based materials) 	<ol style="list-style-type: none"> 1. Health and wellness 2. Malnutrition and nutrition security 3. Climate change and renewable energy <p>Bio based economy was number 13 of 19.</p>

FIGURE 5 Sustainability topics with the highest priority in corporate materiality matrices.

Corporate target setting in case companies followed the triple bottom line including environmental, financial and social issues. They presented various aims, ambitions, targets, goals and aspirations for sustainability. These all are referred as targets in this study. Environmental targets addressed GHG emissions, resource efficiency, sales of sustainable products, sustainable supply chain, RobecoSAM ranking, product stewardship, air emissions and sustainable water management. Targets addressing financial issues included sales, Earnings Before Interest, Taxes Depreciation and Amortization (EBITDA), Return on Investment (ROI) and Return on Capital Employed (ROCE) whereas social targets addressed safety, diversity in executive level, employee engagement and sales of sustainable products.

Changes in target setting since previous year (2015) were detected and especially in terms of sustainable products' sales targets. BASF had included two new sustainability targets to its main goals list: First, assessment of supplier performance and second, increase the proportion of sales generated by products that make a particular contribution to sustainable development, so called "Accelerators", to 28 % in 2020. DSM in turn has had sales target for sustainable "ECO+" products already for years, but they changed the target to include also socially sustainable "People+" products from 2016 onwards. DSM aims for 65 % share of total sales in 2020 with ECO+ and People+ products together. AkzoNobel did not have remarkable changes in its target setting but modified its "Eco-premium solutions" target to include only Eco-premium solutions with downstream benefit and targets 20 % of revenue in 2020. Regarding financial targets, all companies presented new targets by describing them with words or as range instead of exact numbers. BASF had earlier set financial goals for 2020 but

now admits that it is not adhering those anymore, due to the unfavourable global economic development. These changes can be seen as an indication of the direction and emphasis of the actions companies are taking in sustainability during near future.

Sustainability targets were used actively in remuneration and so to engage the top management into sustainability. Annual reports (2015) described companies remuneration policies for the management board and two companies mentioned the policies are aligned further at the executive level. DSM had included sustainability into both short term and long term incentives. At DSM 15 % of short term incentives came from sustainability targets including percentage of successful product launches that meet ECO+ criteria, employee engagement index and safety performance. Long term incentives included energy efficiency improvement and GHG emissions reduction over volume related revenue. AkzoNobel was also clear with the targets and presented 30 % of the long term incentive is dependent on company's sustainability performance measured as the RobecoSAM ranking during the three-year performance period. BASF, in turn, described its policy superficially. Term sustainable performance was used in the policy, but by reading the policy it was not clear if the term sustainable included only long term financial performance or also other aspects of sustainability.

Of the three case companies, two had on-going projects that referred to the term "base of the pyramid.". The third company representative said they were targeting to the middle of the pyramid, but not to the base of it. AkzoNobel webpages supported his view as the term base of the pyramid wasn't mentioned there and no other material about the topic was found either. Based on the limited information available on the web pages and the interviews, it was difficult to evaluate to what degree each of the projects were implementing inclusive business practises, and to what degree they were doing traditional business, social business or philanthropy. However, based on the few examples from data, it can be assumed different options existed. One interviewee brought up company's products that were sold or given by NGO's to the poor in developing countries. This particular collaboration was recognized as a social business case by Michelini and Fiorentino (2012) and partly the description gives an impression of philanthropy. BASF India reported about entrepreneurial solutions they were developing to serve the middle and lower income segments in emerging markets through a BoP project. Reported activities indicated inclusive approach, but the middle segment as BoP markets was somewhat contradictory to Hart (2010) definition and seemed rather traditional business approach in that sense. DSM mentioned at webpages that they continue searching sustainable business models for helping the four billion people at the base of the pyramid. In a later version of the text, instead of word "help" they used words "reach" and "serve" that echoes turning into more inclusive approach. An example of such DSM program at BoP markets was Nutrition Improvement Program that was described as a marketing unit and incubator for incorporating new nutritional products into market-driven, financially sustainable and scalable business models. It was said to support local companies and organizations and so to create opportunities for the whole community to benefit in the form of new jobs, new income opportunities for farmers, retailers and logistics enterprises. Variation in strategies that companies name as BoP strategies was brought up also by Landrum (2014). This study found few examples of case companies' projects that aimed to the base of the pyramid markets. Furthermore, in spite of the benefit those

projects created to the case company or local community, not (at least) all of them were inclusive and align with sustainable value BoP strategy.

This study couldn't identify any projects on BoP markets that would have focused on bio-based products. However, it may be, that such projects and products exist, but those weren't publicly communicated in the way that they would be identified matching with BoP description. Examples of BoP projects from DSM and BASF are, anyhow, included to the five Ps to introduce and inspire the reader how companies are working on in BoP markets, and to evaluate the sustainability marketing portfolio.

Following sections describe the detailed findings how the sustainability strategies are expressed in the product mix.

8.3 Product

The findings show that sustainable chemical products must have good performance in addition to sustainability. This was claimed already in the definition of the sustainable portfolio characteristics of two case companies (FIGURE 6). All three interviewees confirmed that, generally, performance was valued over sustainability. Besides, one interviewee mentioned that performance should be the same or even better than the performance of regular products. This is in line with earlier findings that green products need to show good environmental performance without compromising the functional properties of the product to gain long term market success (Dangelico & Pujari, 2010) and not to emphasize greenness in the cost of broader expectations avoid green marketing myopia (Ottman et al. 2006). Another interviewee added that bad performance can harm brand and the market positioning of bio-based products. On the other hand, it was noted that sometimes the product specifications for a chemical or material are too good for some applications and it is possible to lower the chemical or material quality to fit for a certain end use. Next the more detailed results of the sustainability marketing in the product viewpoint are presented.

8.3.1 Assessing the product sustainability

The state of practice was proved in this study to be using product sustainability assessments, where bio-based origin provided advantage, for R&D steering, sales target setting and measurement as well as for communication. Findings clearly showed that in product development the materials, their sources and carbon footprints were considered carefully as Kotler (2011) proposed for sustainable marketing.

Companies utilized life cycle management, meaning that they considered the costs and benefits of the product life cycle, also those that didn't belong to the case company operations (Hart, 2010). All three case companies had used their own internal assessment methods for evaluating and creating sustainable product portfolios (FIGURE 6). Sustainable portfolios represented products that were environmentally, socially and/or economically sustainable. Definitions for sustainable products varied between companies and BASF seemed to have the widest scope in the assessed cate-

gories. For example, they had included economic category 'cost savings in downstream' and a category named 'United Nations millennium development goals' including many social aspects. At BASF the assessment was made in workshop format which included participants from different functions, for example marketing, sales, technology, product stewardship, R&D and sustainability. BASF's approach was externally assured by PricewaterhouseCoopers. Other two companies also use internal expert opinions from different functions for the evaluation, but did not mention about external assurance for the process. Internally sustainability portfolio assessments were used for steering and stimulating research and development of sustainable solutions as well as to measure the progress as sustainable products' share of the sales. One of the interviewees said the company targets to 80 or 90 % of new products to fulfil sustainable product portfolio requirements. It can be concluded, that companies designed products for sustainability.

Sustainable portfolio assessments favoured products made of bio-based materials with impact categories such as renewables, climate change, emission reduction and natural resources. However, it should be noted that products should perform on all evaluated sustainability areas since, companies stated, there should not be any adverse effects on other impact categories.

BASF Accelerator	AkzoNobel Eco-Premium Solutions	DSM Brighter Living Solutions
<p>Products make a substantial contribution to at least one of the following areas while not having significant negative impacts on any other area of sustainable development:</p> <p>Impact categories:</p> <ul style="list-style-type: none"> •Cost savings downstream •Climate change •Energy •Resource efficiency •Biodiversity •Renewables •Emission reduction •Water •Health and safety •UN Millennium Development Goals <p>Method and data:</p> <ul style="list-style-type: none"> - BASF own method which is externally validated by PricewaterhouseCoopers AG Germany. - Solutions are evaluated in a value chain approach with a cradle-to-grave view and assessment takes into account the three dimensions of sustainability. - Different types of data is used e.g. LCA, regulatory or market data. 	<p>New products and processes that provide the same or better functionality compared to mainstream solutions while being significantly better in at least one criterion and have no adverse impacts in their performance in any of the following criteria:</p> <p>Impact categories:</p> <ul style="list-style-type: none"> •Toxicity and eco-toxicity •Energy efficiency/consumption •Use of natural/renewable raw materials •Emissions and waste •Land use •Risks (production, transportation, use, disposal) •Health and well-being <p>Method and data</p> <ul style="list-style-type: none"> - AkzoNobel own method and carried out by experienced group including R&D, marketing and eco-efficiency experts. - Entire value chain and two dimensions of sustainability are taken into account. - Assessment can be quantitative or qualitative. - New focus in downstream benefits i.e. products and services that provide customers and consumers the defined advantages. 	<p>Products and services that offer superior performance and a clear environmental benefit (ECO+) and/or a social benefit (People+) compared to competing mainstream solutions.</p> <p>Impact categories include:</p> <ul style="list-style-type: none"> •Climate change •Land Usage •Air pollution •Natural resources •Biodiversity loss •Reduction or valorization of waste •Shelf life preservation •Yield improvement •Energy •Hazardous substances •Health •Comfort and well-being •Working conditions •Community development <p>Method and data:</p> <ul style="list-style-type: none"> - DSM own methods evaluate two dimensions of sustainability in whole life cycle. - Internal expert opinions, LCA and DSM's own People LCA are used for assessments.

FIGURE 6 Sustainable product portfolio description in case companies

The utilization of LCA is extensive in chemical companies where it is used as a tool to both validate and find sustainable solutions. LCA was also used as part of assessing sustainable product portfolios. One company representative mentioned that LCA is calculated for all company's products at least on product group level and the company's standard stage-gate product development process includes LCA as a standard concept. Another interviewee said the company had developed their own calculation methods to be used for most of the products and a lean analysis is always

conducted. An example of a wider sustainability evaluation is BASF SEEBALANCE, a socio-eco-efficiency analysis, which takes into account not only environmental (LCA), but also economic (TCO, total cost of ownership) and societal impacts of products and processes, see FIGURE 7. TCO calculation includes also other than purchase costs, including energy costs and environmental protection cost, so it can be seen as a form of full cost accounting. BASF had developed the method together with various academic institutions. For calculating environmental impacts companies used approaches varying from cradle-to-gate and cradle-to-grave to cradle-to-cradle and from self-made to third party evaluated product declarations.

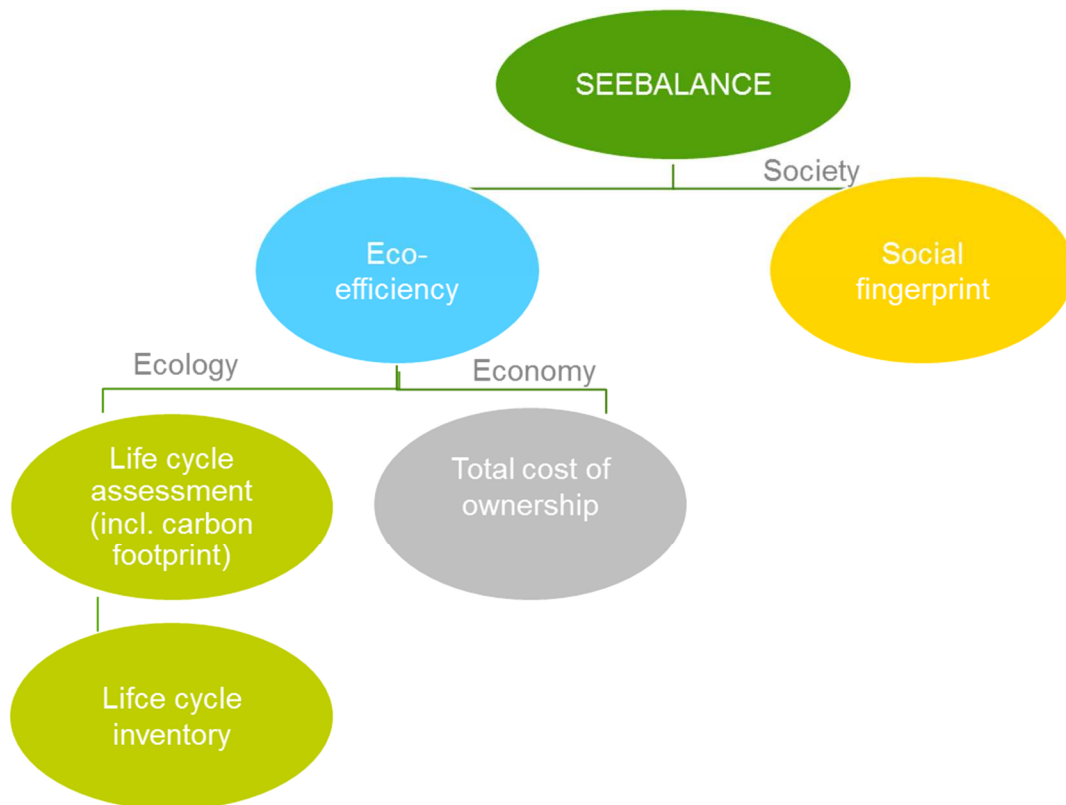


FIGURE 7 BASF's sustainability assessment tool SEEBALANCE includes life cycle assessment and the three pillars of sustainability. Adapted from BASF (2016).

The importance of carbon footprint was confirmed as it was the first product attribute mentioned in the interviews when asking about sustainability preferences in general. FIGURE 8 Greenhouse gas emission along the value chain in BASF 2015 (in million metric tons of CO₂ equivalents). Adapted from BASF (2016, p.108) illustrates the importance of life cycle thinking in carbon emission reduction as only small portion of greenhouse gas emissions in BASF value chain originate from BASF's own production.

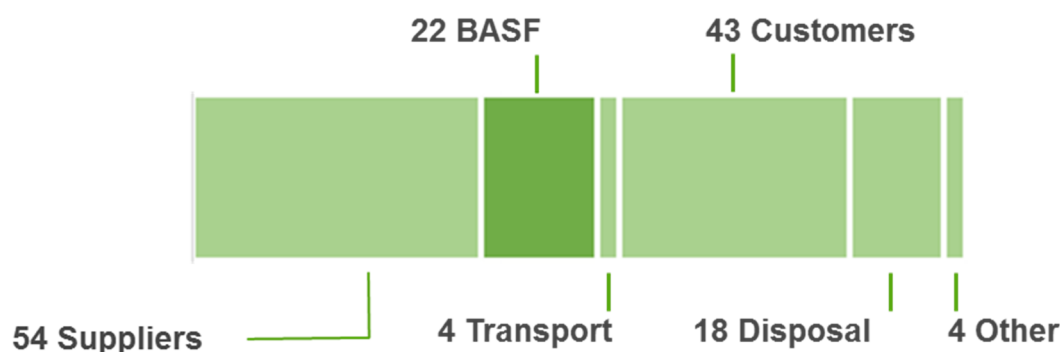


FIGURE 8 Greenhouse gas emission along the value chain in BASF 2015 (in million metric tons of CO₂ equivalents). Adapted from BASF (2016, p.108).

One practical example of utilizing carbon footprint in life-cycle perspective was mentioned in the interviews:

“...if you develop for example a plastic for car because it is lighter than steel, the oil consumption the gasoline consumption goes down and therefore over the lifetime of your car your carbon footprint is lower. By the way, the opposite can also be true if you develop, for example, a nice example is PLA. PLA is a material which is a higher density than polypropylene so if you substitute a automobile part of polypropylene by a PLA part you have to be very careful. Because if it becomes very heavy the use phase can have a huge impact on your carbon footprint and it might not be as sustainable that you were thinking.” (An interviewee comment)

In addition to carbon emissions, other LCA impact categories were also mentioned. Especially land use but also water use were stated by interviewees to gain increasing attention in bio-based materials and company representatives said they usually ask complete LCA instead of narrow footprint calculations. Toxicity was another category that was mentioned in the LCA context. This is also because there are legal demands to decrease the use of toxic compounds. There are several governmental toxicity lists e.g. CMR (Carcinogenic, Mutagenic or Toxic for Reproduction) that demand companies to replace toxic materials with safer alternatives and therefore companies try to search new alternatives for them.

All three companies had taken part in the Roundtable for Product Social Metrics which had established The Handbook for product social impact assessment. It represents method for social life cycle assessment. The handbook recognized social impacts as an emerging topic for chemical companies. Furthermore it stated the lack of global standards on methods for social impact assessment on product level and was therefore aimed to fulfil the gap by providing the method drawing upon the methods used by the members of the Roundtable. (Fontes, 2016.)

Steps towards closed loops were identified in the forms of cradle-to-cradle certification, designing product recycling and aiming to use waste-based chemicals. One company representative mentioned cradle-to-cradle certification as an emerging certificate and pointed especially US where it was said taking up during the interviews. However, during the years, cradle-to-cradle certification seems not to have gained large popularity among the three companies, but has been applied only for single products instead. Cradle-to-cradle approach takes into account the value chain and

recyclability very well and therefore is seen as a reliable proof of sustainability thinking. Cradle-to-cradle certification was considered more valuable for materials than chemicals. Nonetheless, if customers wanted to certify the end product must all separate materials and chemicals, also meet the cradle-to-cradle requirements.

Under the topic recyclability there were two aspects discussed: the general recyclability of the product or the material as such and the related issue of biodegradability and compostability of the product. Recyclability was seen supporting low carbon targets as one interviewee put it:

“If you can recycle your material, your carbon footprint immediately drops significantly.” (An interviewee comment)

For example in automotive industry and consumer electronics recyclability is seen important. It was noted by one interviewee that bio-based materials targeted to automotive industry must be recyclable because of regulations. He stressed that if the product is not recyclable, it is full stop for entering the industry. The Directive 2000/53/EC of the European Parliament and of the Council of 18 September 2000 on end-of life vehicles sets the targets for car recycling. One of the targets is that 2015 all end-of life vehicles the reuse and recovery shall be increased to a minimum of 95 % by an average weight per vehicle and year. There had been developed strong and light-weight composite materials for automotive industry to cut down the fuel consumption and thus make the cars more sustainable. DSM had developed partly bio-based composite EcoPaxx which is used in Mercedes-Benz cars. However, the recyclability of composite materials has been limited because the inherent nature of heterogeneity (Yang, et al., 2012). Seemingly in respect to EU regulations DSM had been studying the recyclability of composite materials and furthermore announced a press release in February 2013 about recycling the composite regrind in cement reduces the carbon footprint and additionally gives economic benefits. Thus it seems that it is not always enough only to develop a bio-based product – there may also be either a need for finding recyclable solutions or new recycling methods.

The study found also an example of using waste-based chemicals as a feedstock. AkzoNobel was taking part to a development project on turning non-recyclable waste into methanol which, according to them, could be used as raw material for many products. This was introduced as step towards circular economy. The CO₂ footprint of this methanol is low as it replaces fossil sources and also avoids CO₂ emissions otherwise produced by burning waste. Similar approach, waste to chemicals, was under research for example at Neste Oy (Neste Oy, 2017). It is possible that such waste based solutions might end up competing with bio-based solutions in sustainable products markets as they have same key benefit - the low CO₂ footprint.

The importance of products' supply chain responsibility seemed to have increased in past few years as supply chains have gained more attention in corporate sustainability target setting and there were also new collaboration initiatives established in the field in recent years. Supply chain sustainability could be proven with certificates or external auditing process. In the interviews the respondents indicated that companies demand environmental certification, sustainability statements and management system certificates from their suppliers. Other standards the companies

were following and asking compliance with from their suppliers were ILO (International Labour Organization) standards. For example at DSM, in addition to company's own supplier code of conduct, the company uses external auditor to validate its supplier's environmental and social responsibility performance. This external auditing process was used for suppliers that are large, or high risk suppliers and who do not yet meet some of the following accreditations: a) SEDEX (4 pillars), b) ethical audits from AIM Progress members c) ISO 14001 together with SA 8000 and OHSAS 18001 d) 4C license to operate.

All three case companies were members of an innovative platform, Together for Sustainability (TfS), that had the purpose to develop and implement audit program to assess and improve sustainability practices within the supply chains of the chemical industry. According to TfS website it offered infrastructure for third party assessments and audits and shares the assessments and audits among its members. The platform had pre-defined set of audit criteria and the suppliers sustainability performance was assessed and audited against them. The scope of a TfS audit or assessment included management, environment, health and safety, labour & human rights and governance. Benefits included avoiding double audits and assessments, improving and assuring quality of assessment and audit results, lowering risks in relation to sustainability requirements. (Together for Sustainability, 2016.)

8.3.2 Sustainability and the use of bio-based products

The customers were said to look for overall sustainability, but still, they often automatically think that a bio-based product is more sustainable option compared to products with fossil origin. However, companies were aware and open about the sustainability challenges of bio-based materials. It was acknowledged by the interviewees and stated on the companies' webpages that renewable raw materials are not intrinsically sustainable. Palm kernel oil was mentioned as an example of a challenging bio-based raw material. Companies referred to debated issues such as competition with food, land use (land use change and indirect land use change), GMO, distributive justice, water use and biodiversity loss. Two interviewees pointed that the source of biomass should be sustainable and traceable.

"Companies don't want to be associated with cutting down tropical forests or other such issues" (An interviewee comment)

Partly same methods were used to validate the bio-based products' sustainability as were used for products overall sustainability: carbon footprint calculations were used according to one respondent and web pages indicated that LCA is used for the same purpose. Sustainability standards and certificates as well as non-food renewable feedstocks were seen as solutions improving bio-based products sustainability in particular. In 2013 interviews ISCC Plus certification was recognized only by one interviewee. He told that the company was using ISCC Plus to a small degree for tracing some materials. Another interviewee did not think there were any external verification, namely certificates, to validate the material or chemical is bio-based, but the company was said to have internal indications for bio-based raw materials and products.

Further, BASF had developed its own mass balance method together with TÜV SÜD to allocate renewable feedstocks to respective sales products. Resulting share of products were sold as certified renewable products. The basic logic behind BASF's method reminds ISCC Plus mass balance method (ISCC, 2012). BASF's method was applied to products such as superabsorbents, dispersions, plastics and intermediates.

Reported use of bio-based raw materials in case companies during year 2015 and 2014 (2014 figures in parenthesis) was: BASF 5,8% (4,5 %) of raw materials purchased worldwide were from renewable sources, at AkzoNobel 5 % (7%) of all raw materials and 11 % (13 %) of organic raw materials were bio-based whereas at DSM 16 % (11 %) of total spend on raw materials related to renewable raw materials. Share of bio-based materials had been increasing at BASF and DSM.

Companies had several bio-based products available, including both drop-in chemicals and novel chemicals. Bio-based products were referred as bio-based or renewable products. One of the interviewed companies was said mostly to focus on drop-in bio-based products. One example of such product was bio-based butanol that is used as solvent for paint. In that case the material properties are the same for bio-based compared to fossil based so drop-in chemicals are relatively easily adopted by the customers. Another person pointed out the opportunities in novel chemicals, which are made of bio-based sources and in addition have different performance, namely better or more suitable to certain end use. Referring to this idea, was relatively new product, PBS (polybutylene succinate) mentioned as an example. Succinic acid (which is itself a bio-based drop-in chemical, but more cost efficient compared to petrochemical based product) is used for polymer PBS which is a new type of polymer combining bio-renewability with new performance. Companies believe the markets for this product, although not yet established, will to grow. These totally new products were believed to need more marketing efforts and time to achieve the trust from customers. However, there may lay better chances for radical innovations.

Companies seemed to have real demand for sustainable bio-based products, both first and second generation. In 2013 first generation biomass were said to be in use and companies were actively looking for second generation options, meaning products. Opinions of the reasons why they don't utilize much second generation biomass varied from availability to price.

"..so what we say to our suppliers, so for now there is no, or hardly any second generation biomass available in the market and it's still too expensive" (An interviewee comment)

Using first generation biomass was seen acceptable in developing phase but the aim was said to be in using non-food raw material.

"..some of our developments start with first generation, but we always have the aim to go to second generation" (An interviewee comment)

"..we accept that the companies are working with first generation feedstock, but we insist them to develop second generation and as soon as possible." (An interviewee comment)

For example AzoNobel (2018) described very clearly on its website that it was looking for of sustainable bio-based chemical building blocks. In addition to sustainability, performance and price criteria were :

- “ Routes to existing building blocks (e.g. monomers) from renewable/bio-based starting materials
- Access to new or alternative building blocks from renewable/sustainable feedstocks which provide competitive solutions to deliver performance (e.g. enhanced weathering, enhanced fouling control etc.)
- Renewable/sustainable polymer binders” (AkzoNobel, 2018)

Companies gave examples of their development projects with bio-based products at webpages. DSM had commercialized bio-based succinic acid and developed commercial scale cellulosic ethanol production. In addition, DSM provides bio-based resin (Decovery) for paints and uses castor oil and rape seed oil for its partly bio-based materials (EcoPaxx). Castor oil can be seen as non-edible, second generation feedstock as is the cellulosic biomass for ethanol. Rawmaterial for succinic acid and resin was not revealed on web pages, instead it was referred as sustainable biomass. Consequently, current rawmaterial was most probably of first generation. BASF has also bio-based succinic acid production and it was developing another chemical building block, furandicarboxylic acid (FDCA), from fructose. In 2015 BASF provided bio-based polytetrahydrofuran (PolyTHF) for testing various applications in large scale. BASF also produced bio based resins for coatings. Assumingly, BASFs product examples are of first generation rawmaterials as the second generation wasn't stated in product information. AkzoNobel had several development projects going on, but web pages didn't inform any projects would have proceeded into production phase. Four collaborative projects were published: bio-based polymers that may be used for example in coats and construction (2017), bio-based building blocks from photosynthesis to replace some of the raw materials AkzoNobel currently obtain as fossil-based (2014), chemicals from sugar agricultural cellulose side stream resulting from sugar beet processing (2016), and chemicals from wood.

This study couldn't identify any bio-based products from the case companies that specifically served the BoP markets. DSM's main effort seemed to be in the micronutrients and combating malnutrition. DSM was also involved in business projects that supported rural farmers with diagnostic tools, training modules, basic farm management and animal feed. Programs were focusing on dairy, renewable energy and cattle feed. In addition DSM was involved in boosting education through a school made entirely of composite resins by DSM. Light and modular composite design was said to save money, environment, time compared to traditional concrete building. BASF in turn, focused on affordable mass housing, food fortification, food packaging and storage, solar and wind energy, water purification and personal care.

Based on the interviews it can be said that the product sustainability is strongly associated with environmental sustainability. Safety issues weren't especially highlighted by interviewees, but there were some emerging development activities going on at the social sustainability area, including BoP markets.

TABLE 7 Implementing sustainability marketing in product aspect.

	Pollution Prevention	Product Stewardship	Clean technology	Base of the pyramid
Product	<ul style="list-style-type: none"> • ND 	<ul style="list-style-type: none"> • Life-cycle management with LCA. Focus on carbon, land use, toxicity and social aspects • Design for sustainability by using LCA and own methods for product development steering • Full cost accounting with own methods, Total cost of ownership • Sustainability of the activities in product supply chain 	<ul style="list-style-type: none"> • Sustainable technology, bio-based products • Leapfrog technology could be sustainable second generation bio-based products or novel chemicals with new properties • Cradle to cradle certification is used for certain products • Bio-based feedstocks are used • Waste-based feedstocks under research • Creative destruction of old product portfolios by bio-based drop-in products that substitute fossil based. Even more so by new kind of bio-based products, e.g. PBS • Good or optimal performance 	<ul style="list-style-type: none"> • ND

8.4 Price

In this study, bio-based products were indicated to offer an exception to the rule that customers demand the same price for sustainable products than regular products, and sustainability is seen as an advance in purchase decision making only if other product attributes are at the same level with competing products (Belz & Peattie, 2009). This chapter focuses on the interview material, as price information wasn't available in other reviewed data sources.

8.4.1 Opportunities to gain high price for sustainable bio-based products

It was agreed that there were very few materials that companies would be able to pay a higher price because of sustainability.

*"But as we see it, consumers, they like those (sustainable) products, but they don't want to pay more."
(An interviewee comment)*

*"In general there is very few material that companies would be able to pay a (sustainability) premium."
(An interviewee comment)*

In contrast to the general approach, two respondents claimed that higher price is paid for bio-based products, but additional bio-based premium was rarely attained. According to one interviewee, higher price was usually paid and gained because of higher raw material cost. However, he continued, in some areas the trend had changed lately from preferring price and performance to preferring bio-based raw materials over other product features. For some “new approach bio-based products” the company was able to add a premium to the price only because of bio-based raw materials.

There were few other exceptions when higher price was said to be possible to attain for sustainable products. First, for consumer products “green premium” was seen more likely to be gained than for industrial products. Accordingly, bio-based products offer companies an option to price their offerings according to the level of sustainability performance because there are consumers who are willing to pay more for sustainable products (Kotler, 2011; European Commission, 2014). Second, it was found that the case companies do have sustainable products that are more expensive to buy but they create cost savings in use. As an example, several engineering plastics were said to be more expensive to purchase compared to other materials but in contrast saving users money in applications more than the additional purchasing cost was. Replacing steel with more expensive specialty plastics in cars make the car lighter which enables the use of an engine with less power in it which further gives environmental and monetary benefits for the end customer. Similarly, savings in the total cost was noted in the third exception although the benefit was postponed. Two interviewees said it was accepted that new products might be more expensive because of the development costs. One interviewee clarified that it was seen possible to pay extra for their raw materials in the beginning, one or two years, but later the product should be cheaper to pay back the difference that was paid in the beginning. Kotler (2011) has also presented that on B2B markets the higher purchasing price of sustainable products is usually paid back as savings in overall costs and Reinhardt (1998) has rationalized that on B2B markets the total cost is ruling buyers decision making over brand and image. However, as a fourth option, one company representative mentioned that for front runners there is sometimes possibility to get premium price for longer time. He added there shouldn't be too high expectations for price premium, but if there are supportive legislation demands it can help a lot in leveraging price. An example of such was LEED (Leadership in Energy and Environmental Design certification) supporting legislation in US. One interviewee commented that a proper small niche does pay huge extra for bio-based products, but key to that is that the bio-based material really is sustainable without compromises.

8.4.2 Opportunities in low and standard priced sustainable bio-based products

At the time of the interviews, company representatives couldn't come up with a bio-based material or a product that would be cheaper to purchase than corresponding standard product. However, as a future scenario, two interviewees believed bio-based products will give cost advantage and more stable raw material prices compared to fossil-based products. This might provide an opportunity for sustainable bio-based

products to be less expensive compared to corresponding traditional, fossil based, products.

Despite the possibility to get higher price for bio-based products, it is somewhat contrary to the suggestions for sustainability marketing. It is suggested that in order to practice sustainability marketing, companies should proactively develop superior products at standard market prices instead of developing less effective and more expensive alternatives targeted to readily environmentally conscious consumers (Achrol & Kotler, 2012). Furthermore, it seems that being able to follow this approach could provide an opportunity for competitive advantage, cost leadership (Porter, 1985), as “the standard market price” is currently rare and hard to imitate among new bio-based products. Moreover, high cost structure and product price might be explaining the noticed absence of novel bio-based products at BoP markets, because BoP markets would require new value propositions with lowered cost structures (Landrum, 2014). Radical innovations lowering bio-based products’ price would create competitive advantage and open the door to the blue ocean at BoP markets.

TABLE 8 Implementing sustainability marketing in price aspect.

	Pollution Prevention	Product Stewardship	Clean technology	Base of the pyramid
Price	<ul style="list-style-type: none"> • ND 	<ul style="list-style-type: none"> • Higher or same price for sustainable products in general. • Higher purchasing cost is usually paid back as savings in overall cost. 	<ul style="list-style-type: none"> • Higher for bio-based products. • Opportunity for lower price in the future compared to fossil-based products. 	<ul style="list-style-type: none"> • ND

8.5 Place, distribution

Case companies had certified management systems in use at the production sites: environmental management systems, ISO 14 001, EMAS, occupational health and safety system OHSAS 18 001. In addition they have applied the chemical industry’s own Responsible care that aims improvement in both production site and product stewardship. These management systems were used for continuous improvement. Sustainability justifications were found for choosing the production sites. For example, the production of some dangerous chemicals that are not safe to transport by any means were located close to the customer. Also proximity of resources, raw materials and qualified people as well as energy, was used as arguments in decision making as voiced by two respondents. The interviewee continued that these choices were made also because of cost advantage. As stated by an interviewee, LCA was used for strategic decisions such as locating production lines.

All companies aimed to eco efficiency and resource productivity. These were addressed in sustainable product portfolio assessments, so the scope was extended from

production site to cover other parts of the value chain. Practical example of eco efficiency and cost savings was BASF's large production verbund –concept sites. In verbund –concept integrated plants, energy and waste flows, logistics and site infrastructure create cost savings and environmental benefits.

Also pollutants were addressed in every company's sustainable portfolio assessment. Also waste and risks were mentioned by some of the companies in the assessments. AkzoNobel had a vision 'zero injuries, (landfill) waste and harm'.

In general, the environmental and safety impacts of transport were seen relatively small by the interviewees and there wasn't much information on the webpages either. One interviewee pointed that the cost reasons define the form of shipping. The sustainability focus was seen to be elsewhere, for example in reducing carbon footprint of production operations and purchased materials, because in transport or location there was less to gain, see FIGURE 8. However, there were actions towards sustainability on this area also. For example, AkzoNobel had joined on sustainable shipping initiative in which the goal was to reduce environmental impacts.

According to one interviewee, a "take-back" scheme had been created for waste paint. Waste paint was said to be recycled at the production sites and also taken back from the customers including consumers. The respondent was a bit unsure about these scheme details and no more information was found from other sources, so the operation model should be considered with reservation. However, he knew that this was done in collaboration with another company which recycles the paint and then sells it to the other markets with another label and lower price. It was emphasized that there is nothing wrong with the quality of the product.

Global coverage of the case companies' operations was wide. BASF had companies in more than 80 countries and 334 production sites. It said it supplied products to nearly every part of the world. AkzoNobel had activities in more than 80 countries. DSM, in turn, had more than 100 production facilities in over 40 countries.

New production facilities, the joint ventures, to produce bio-based chemicals, were located in Europe, except one that was in US. DSM and BASF had biosuccinic acid production in Europe, in Italy and Spain, respectively. Joint venture to produce furandicarboxylic acid was located at BASF's own site in Antwerp. DSM's cellulosic ethanol production site was in US. AkzoNobel had several development projects going on, but the information about locations was limited. However, the partners were from Europe, the Netherlands and UK.

Case companies had many operations units also in developing countries and interviewees voiced that the way how sustainability is considered there should be the same as in Europe, for example. Two case companies also wrote on the web pages that they were developing new business models for BoP markets. An example of BoP business model was from DSM's Nutrition Improvement Program which was helping KeBAL, a social enterprise, to transform into viable franchising concept providing nutritious meals. KeBAL was planned to be replicated across Indonesia and later to other countries. DSM had BoP projects in India too, which they see as a starting point for the base of pyramid thinking according to the company representative. BoP projects were seen as opportunities, but they were not necessarily paying themselves yet as they are in the early phase of innovation, according to the interviewee. BoP projects are seen to fit the company vision. Another example was BASF India's beauty and

hygiene products. BASF had initiated a business to partner with local manufacturers to set up high quality, economical beauty products. Products were then marketed and distributed with in association with Local Self Help Groups run by women entrepreneurs who connect with beauty salon owners. This had opened the doors to untapped markets of rural and semi-rural India. The business model was said to brings value to local community from manufacturing, marketing and end customer phase and therefore can be seen as somewhat inclusive business. In his future and sustainability focused marketing paper Kotler (2011) writes about *place* that location of production and distribution facilities needs to be assessed, because there are people who prefer locally based production. On BoP markets it's not all about preference, it is also about reaching the poor and/or rural customers and creating value for the local community in the value chain instead of just selling low priced products. Both, DSM and BASF, models seemed to include an opportunity for that. However, BASF referred markets as base of the pyramid markets, but also used term 'middle-income groups' in the same context, so it is possible that the poorest at the base of the pyramid were to be neglected in the business model. Hart (2010) had noticed that rising middle class has already gained a lot of attention from large companies, but with BoP he refers to the more than four billion people at the base of the economic pyramid. It remained somewhat unclear what is counted to BoP markets by BASF and DSM and is it in line with the sustainable value concept.

TABLE 9 Implementing sustainability marketing in place aspect

	Pollution Prevention	Product Stewardship	Clean technology	Base of the pyramid
Place	<ul style="list-style-type: none"> • Pollution prevention • Waste reduction • Env. management systems • Eco-efficiency • Risk management • Resource productivity • Zero pollutants and accidents • Continuous improvement • Large integrated production sites 	<ul style="list-style-type: none"> • Take-back • Responsible care • LCA used in locating production site • Sustainable shipping 	<ul style="list-style-type: none"> • Production in new facilities at existing production sites. • Production mainly in Europe 	<ul style="list-style-type: none"> • Base of the pyramid • Pro-poor business • Local production • Franchising • Local Self Help groups used for distribution

8.6 Promotion, marketing communications

Annual reports and web pages contained extensive information regarding sustainability communication. The need for transparency in reporting was well acknowledged in general, but also as new topic in materiality matrix at DSM. They had recognized

the stakeholder need for more transparent information about tax payments, environmental and social impacts and remuneration of the managing board, for example.

Case companies utilized sustainability arguments in their sales. However, it was told by interviewees that it depended on the product and the market segments whether sustainability was used as the leading argument. Sustainability was said to be a very good additional argument but alone it was not enough. As mentioned earlier, the good performance was needed as well. In general, the interviewees were not very well aware of the details in the usage of sustainability arguments in promotion and communications. However, Internet sources draw a picture what kind of sustainability communications companies practice.

Practical communication example highlighting the performance capabilities of a bio-based product was from the DSM press release of Mercedes-Benz taking into use DSM's 70 % bio-based (castor oil) material for engine cover:

"EcoPaXX is 70% bio-based, but its 'green' credentials come at no cost to performance," says DSM's Tintel. "It combines superb mechanical properties with excellent chemical resistance in various media." (DSM, 2013).

Sustainability portfolio assessments were used for external communication and marketing purposes. As mentioned earlier, BASF's approach to portfolio assessment was externally assured by PricewaterhouseCoopers. What Kotler (2011) writes about sustainable marketing mix and communication seems to be everyday business for the case companies – they are using highly specific information in environmental footprints. Companies use LCA results as selling arguments, especially for biopolymers, to prove that the product provides a more sustainable solution compared to competitors. BASF had published guidelines for carbon footprints:

"Assess products over their whole life cycle: When calculating a Product Carbon Footprint, the complete life cycle of a product from „cradle to grave“ needs to be considered, from raw material extraction over production, selling and use to disposal or recycling. For “supply chain business-to-business” use, a partial carbon footprint shall at the minimum represent the cradle-to-gate emissions arising from stages, processes/modules up to the point where the next business takes ownership of the product.”

"Transparent and uniform communication of Product Carbon Footprints: A prerequisite for a meaningful climate-related product labeling is -besides a harmonized method for calculating a PCF- a uniform, transparent and understandable form of communication, which ensures that a customer's purchase decision contributes to mitigating greenhouse gas emissions and allows for a comparison with alternative products. We do not support a simplified label showing only a CO₂ number without further information" (BASF 2013)

Certificates were also used in communication as DSM's example of cradle-to-cradle certified plastics:

DSM's collaborations with Giroflex and with Herman Miller are examples of how Cradle to Cradle® has become a focal point for entire value chains to work on sustainable products and processes. Achieved only through open and collaborative innovation, teamwork and long-term partnerships, Cradle to Cradle®, modeled on nature, is a great inspiration on the path towards a sustainable system – one that is good for the environment, but also good for business. DSM is open for ideas on how the Cradle to Cradle® concept can lead to innovations in your business. (DSM, 2013)

As mentioned earlier, cradle-to-cradle certification didn't seem to be widely used in chemical industry. However, there were few examples, as AkzoNobel had also announced it used cradle-to-cradle certified carbon black pigment originated from old tires.

In addition to certificates, sustainable products and partnerships can be used for signalling sustainability to supply chain partners, investors and the society (Cronin et al., 2011). The case companies had applied all these. Based on the websites, partnerships' seemed to be important for signalling about bio-based products. For instance, new bio-based products were introduced by informing about the joint ventures and proceeding in them. One of the joint ventures' purposes was also marketing. In BoP markets, partners are most probably used for communication as well. For example, BASF India, that uses Self Help Groups to market beauty products in rural areas.

Based on the communication, case companies seemed to aim to tackle the trap of green (sustainability) marketing myopia (Ottman et al., 2006). They communicated about well performing products in connection with environmental performance, they had educational web pages and they used certificates from trustworthy third parties. Companies had developed own methods and certificates for assessing and communicating sustainability of the products. Especially BASF had sought to build trust towards its own methods and certificates by using third party assured methods.

TABLE 10 Implementing sustainability marketing in promotion aspect.

	Pollution Prevention	Product Stewardship	Clean technology	Base of the pyramid
Promotion	<ul style="list-style-type: none"> ISO 14001 	<ul style="list-style-type: none"> Transparency CSR Full cost accounting LCA Footprints Product labels Product declarations ISCC Plus 3rd party audited data 	<ul style="list-style-type: none"> Repositioning Joint ventures' one purpose was to market bio-based products Joint ventures and proceeding in them were used in introducing the aims to produce bio-based products. Communicating performance 	<ul style="list-style-type: none"> Local Self Help Groups used for marketing

8.7 Partnering, collaboration

Case companies had versatile collaboration for sustainability with their stakeholders ranging from value chain partners to NGOs. Two of the case companies announced on their webpages that they had established external advisory boards to work as sparing partners to the company executives in sustainability matters. Sustainability boards included experts from science and industry. They were supporting executives in strategic issues, understanding external stakeholder needs and handling dilemmas.

Next collaboration modes are explored from the viewpoint of current and future business.

8.7.1 Partnering with current business stakeholders

Based on the interviews, in sustainability matters, the most often mentioned collaboration modes were information exchange for LCAs and footprint calculations. This was done mainly in the customer and supplier networks. In general, it was customers on which companies seemed to put the most collaboration effort - suppliers are also involved, but to a lesser extent according to a one company representative. LCA optimization was one example; another was key supplier agreements in which they had set targets for example decreasing carbon footprint with a certain percentage and during a certain time period. In this area the interviewees stated their companies not only set targets but also try to find the solutions together. Moreover, a marketing was done together.

Developing the product to work in applications and final tuning of the product was said to be done in very close cooperation with the customers. This was the same for regular as well as for bio-based products. One interviewee gave an illustrative example about the need for close customer cooperation that works especially well for new sustainable materials development: the product specifications for a chemical or material are sometimes too good for an application or end product and therefore it is possible to lower the chemical or material quality for it to fit a certain end use. The end product properties and use should define material and chemical performance, not just the specifications of the materials that are commonly used for that purpose. Finding these spots requires close collaboration with the customer. In addition to direct customer collaboration, successful collaboration in sustainable product development with customer's customer was also mentioned.

Collaboration on sustainability with competitors and other companies was also common. Chemical industry associations and World Business Council for Sustainable Development (WBCSD) were examples of such forums for collaboration. In WBCSD there is a chemical sector group that works for common shared targets in the chemical industry. One example is developing life cycle assessment standard to measure same things in same way to achieve comparable figures. Also exhibiting is improving the market uptake of more sustainable chemical solutions, such as light weight plastics instead of heavier and more energy intensive metal materials in automotive industry. Other examples of collaboration between companies were the earlier mentioned Together for Sustainability, the Roundtable for Product Social Metrics and the Sustainable Shipping Initiative. BASF had been active in sustainability metrics development with external partners. It had developed sustainability SEEBALANCE with universities and the mass balance method with TÜV SÜD.

In terms of local communities, attention was paid to the production sites' neighbours. For example, BASF had established community advisory panels to strengthen trust in the community on their activities. AkzoNobel had a special community program that encourages employees to engage in hands on involvement in their local communities.

Companies advocacy included activities in industry bodies, public forums, NGOs and other stakeholders. In dialog with politics and society they aim to create favourable conditions for business activities for example to engage regulators Companies said they wanted to support legislation, standards and initiatives for safer and sustainable products in the industry

8.7.2 Partnering with new business stakeholders

Case companies had established a few joint ventures for developing, producing and marketing bio-based products. In addition, they had made investments to technology funds and directly to new start-up companies. Large chemical companies collaborate with other companies in order to produce new bio-based products, where first generation feedstocks seemed to dominate in these collaborations and the use of second generation bio-based materials was rare. One interviewee stated, that the most valuable partners are the ones in the value chain that complement your knowledge. According to him, chemical companies typically need companies and organizations to partner around their own competence, for example with those that are active with the feedstock. It was recognized by this company representative that especially in the bio-based economy there is a need for partnering and joint ventures because of creating completely new value chains. He stressed the idea of partnering and building the new value chains together instead of supplier, customer and competitor settings.

Companies gave examples of their collaborative development projects on bio-based products on web pages. DSM claims to be a technology player for the bio-based economy and aims to develop a leadership position through acquisitions and partnerships. It was working across value chains and the company highlighted its chemocatalytic and biotechnology capabilities. It had commercialized bio-based succinic acid with Roquette and developed cellulosic ethanol with Poet, both in joint ventures. DSM had also made investments in "start-up" companies producing bio-based materials, but venturing portfolio showed these were made in 2010 or earlier. BASF had also bio-based succinic acid production together with Corbion Purac. In joint venture with Avantium, BASF is developing another chemical building block, furandicarboxylic acid (FDCA), from fructose. In 2015 BASF provided bio-based polytetrahydrofuran (PolyTHF) for testing various applications on a large scale. PolyTHF was derived from butanediol which BASF produced under licence from Genomatica. BASF's venturing portfolio included technology for converting cellulosic biomass into sugars. AkzoNobel had also several development projects with other companies: with Itaconix to produce bio-based polymers that may be used for example in coats and construction, with Photanol for chemicals from photosynthesis, with Royal Cosun for chemicals from sugar and with Avantium for chemicals from wood. AkzoNobel had established Imagine Chemistry -start-up challenge which is to strengthen AkzoNobels approach to open innovation. The company aims to further develop business opportunities stemming from the challenge. AkzoNobel also participated in a collaborative venture capital fund, focused on early stage chemical and clean technology start-ups. These traditional chemistry companies clearly need partners for speeding up the switching to renewables that require radical technological innovations. Interestingly, competitors shared same partners (Avantium) and some of the partners operate in

same sectors (DSM and Roquette in animal nutrition, personal care, food and beverages and pharma).

In addition to companies NGOs are also recognized to possess complementing competencies. Environmental NGOs such as Greenpeace and WWF were mentioned by all interviewees and seen as obvious stakeholders to cooperate with the chemical industry. Organizations that bear competencies in social sustainability and people aspect are also considered important. One example of such a partnership was between DSM and United Nations World Food Program; the company also had another partnership with World Vision. These partnerships seem to be at least partly philanthropic. BASF has also engaged in Public Private Partnerships – BASF has established production for mosquito nets against malaria. Nets are sold or given to the poor via different NGOs.

Companies seemed to have collaboration in BoP projects but it was not directly linked to bio-based products.

TABLE 11 Implementing sustainability marketing in partnering aspect.

	Pollution Prevention	Product Stewardship	Clean technology	Base of the pyramid
Partnering	<ul style="list-style-type: none"> • ND 	<ul style="list-style-type: none"> • Stakeholder management • NGO • Suppliers • Customers • Regulators • Communities • Media • Universities • Competitors • Certification bodies 	<ul style="list-style-type: none"> • Unconventional partners: start-ups and other companies from the same industry 	<ul style="list-style-type: none"> • Base of the pyramid • (Rural) poor • NGO • Communities • Local Self Help Groups • Local Governmental authorities

9 CONCLUSIONS

This final chapter provides answers to the research questions presented at the outset of this study and thus provides synthesis of the three cases. It summarises the main findings and draws conclusions based on the research questions. It also discusses limitations of the study and presents areas where further research is needed.

9.1 Contributions of the study

This study has provided a description of potentially successful sustainability marketing strategy elements for a bio-based materials and chemicals business. It has defined sustainability marketing strategy as application of corporate sustainability strategy in marketing strategy and practice. Building on that, the study shed empirical light on how companies apply Hart's (2010) sustainable value -concept in sustainability strategies and in marketing practises.

This thesis makes two major contributions. First, it has built a conceptual framework for sustainability marketing that serves further research. It also offers a managerial tool for companies to assess the degree to which they have addressed sustainability marketing strategies and to identify opportunities for further improvements. Bio-based products were in the focus of the framework, but it is applicable also to other types of products.

Second, by utilizing the created framework, the study identified elements of sustainability marketing strategy that can create competitive advantage for companies. Here again, the study concentrated on areas that are linked to bio-based products.

9.2 Answers to the research questions

The primary aim of this thesis was to describe successful sustainability marketing strategy elements of bio-based materials and chemicals' business to gain competitive advantage. With this purpose in mind, research was designed to address and respond to the three research questions.

RQ1: How is competitive advantage derived from sustainability marketing, based on literature?

This study defined sustainability marketing as application of corporate sustainability strategy in marketing strategy and practice. It also acknowledged that sustainability issues should be looked through the same lenses as the overall business strategy. Stemming from this premise, sustainable value -concept was identified as a potentially successful sustainability concept to guide a business in creating a strategy to gain competitive advantage. Sustainable value -concept encompasses ideas presented in business strategy concepts to gain competitive advantage: it proposes entering new

markets with innovative products and business models and guides to develop internal competences and engage external stakeholders.

When sustainability strategy is incorporated into marketing strategy can products' sustainability marketing be implemented by marketing mix. It is acknowledged that marketing mix components, alone or together, can be a source of competitive advantage when used effectively. Because the importance of partners to competitive advantage of a company is recognized in business, sustainability and marketing theories, it should be added to the traditional marketing mix 4 Ps. Therefore upgraded marketing mix composes of five components: product, price, place, promotion and partners.

As a conclusion, competitive advantage can be derived from sustainability marketing by incorporating elements of sustainable value -concept to upgraded marketing mix components and effectively executing them. It should be kept in mind that the balance between sustainable value concepts' strategies - pollution prevention, product stewardship, clean technology and base of the pyramid - should be pursued to gain competitive advantage both in current and future business, to avoid greenwashing and myopia. Furthermore, the elements with which a company aims to gain competitive advantage should be valuable, rare, in-imitable and non-substitutable to sustain the competitive advantage.

RQ2: What kind of sustainability strategy portfolios are the sustainability leaders in chemical industry executing? Focus on elements that relate to bio-based products.

Findings of this study show two of the three case companies, BASF and DSM, utilize all four strategies of the sustainable value -concept. In terms of AkzoNobel the study could not identify any actions in implementing BoP strategy. For bio-based products all three companies seem to follow only three of the strategies, and BoP strategy was non-existent.

Observations indicate that balance in implementing the four strategies has not yet been achieved by any of the companies. BoP strategy is emerging at BASF and DSM. Main emphasis seems to be in product stewardship and clean technology strategies, which could be described as institutionalized and established, respectively. This is an interesting finding, because the sustainable value -concept proposes that there should be a balance between strategies addressing current businesses (pollution prevention and product stewardship) and future businesses (clean technology and BoP). It also suggests, that there should simultaneously be a balance between strategies that address internal competence development (clean technology and pollution prevention) and external stakeholder engagement (product stewardship and BoP). When grouped this way, the balance is found in the areas by implementing only the two strategies. However, the competitive advantage is supposed to be better if all four strategies are in balance because it would be harder for competitors to imitate.

The case study results show that these global chemical companies are very active in clean technology strategy in the bio-based chemicals fields and they seem to have bold strategies on sustainability. Some companies have proceeded to production phase and all have ongoing development projects on new bio-based products. This supports the assumption that sustainability leaders get competitive advantage from

sustainability strategy. Effective implementation of the sustainability strategies is supported from the top of the two companies with including sustainability in executive remuneration targets.

RQ3: How should the sustainability strategies be expressed in marketing, particularly in the context of marketing mix to succeed in the markets? Focus on most important elements that relate to bio-based products.

Bio-based products belong to clean technology strategy and provide opportunity for repositioning, future competitive advantage and economic growth. To succeed in the markets, bio-based products need to perform well in the application they are used, be truly sustainable and sustainability should be verified. Basically, verification can be done by using LCA, including carbon footprint, water use, land-use and toxicity assessments. Social effects' LCA has gained popularity in recent years, so it should be addressed as well. It is advised to use LCA already in the development phase of the new products to ensure best end result.

Raw materials need to be sustainable. Currently first generation feedstocks are accepted, but second generation feedstocks would be preferred if they were available. Based on this, bio-based products made of second generation feedstocks would have competitive advantage in the markets. This study suggests that bio-based product chain of custody certification IPCC Plus, has not yet gained popularity. However, for controversial bio-based raw materials, for instance palm oil, a chain of custody certification is advised to be used. Also, for other raw materials it may be beneficial to trace the origin and also signal the bio-based origin.

Drop-in solutions are considered easier in terms of market approval compared to novel chemicals. Thus, it is recommended to carry out high marketing effort for novel chemicals.

When a bio-based product is sustainable without compromises, there is an opportunity to get higher price compared to fossil-based products. Especially when introducing a new product, higher price can be obtained during first years. However, in terms of pursuing sustainability marketing, standard or lower price would be recommended. It could also serve as a source of competitive advantage.

New production facilities for bio-based products have been established on existing production sites in Europe and the US. Therefore, it is assumed that production of bio-based products implements eco efficiency. In the visions such plant could demonstrate zero accidents, waste and pollution approach.

Collaboration with a wide range of stakeholders and co-development of products with other companies can provide advantage. Findings suggest that joint ventures are a common way to develop, produce and market bio-based products. Close collaboration with other companies to produce new sustainable bio-based chemicals with new technologies may be seen as one way to acquire required new skills and at the same time disruptive innovations are nurtured in separate organizations, safe from the MNC norms. Developing the sustainability practices in the area of product stewardship can be done in collaboration with other companies in different kinds of organizations. Also universities can be partnered with to develop tools and methods to implement product stewardship strategy.

Communication ties up the other marketing mix components. Elements that are emphasized in them are used effectively in communication with stakeholders. Thus bio-based strategy can be used for repositioning a company that operates on mature markets.

9.3 Limitations of the study

The study aimed to cover relatively large study area with a laborious method, multiple case study. The intrinsic nature of case study is provide in-depth analysis of the topic. In this case the thoroughness of the study is implemented by numerous examples which are, due to limited resources, described relatively lightly, but when synthesized together they supported deep analysis of the topic. There were observations in which data was found only from single source, for example from an interview. It was noticed that selected data included limited data of such topics as place and promotion. It should be noted that there may be more actions in pollution prevention and BoP strategies, but those couldn't be identified with the used the data collection methods and data sources. Due to the inherent nature of product stewardship strategy – it emphasizes stakeholder viewpoint and transparent communication - it is possible that it is overrepresented in the observations. With more resources, the construct validity could have been improved further, for instance, by conducting more interviews and by asking other kind of data from the companies. However, the final conclusions were supported by many observations and therefore based on data from multiple sources.

Larger amount and wider geographical distribution of the case companies would have led to better validity of the results. In case studies it is important to examine also rival explanations. It can be questioned whether the competitive advantage is really (partly) derived from sustainability marketing or somewhere else. To strengthen and further validate the conclusions of the study, it would have been beneficial to conduct additional case studies using theoretical replication and study cases that predict different results, meaning studies on companies that do not perform well on either economically, environmentally or socially. Furthermore, the geographical distribution of the case companies was narrow, even inside Europe as there are only two countries represented – Germany (BASF) and the Netherlands (AkzoNobel and DSM). Nevertheless, these market leader companies have large global operations and therefore are expected to represent frontrunner companies on global level.

9.4 Further studies

A key assumption behind the study was that companies on DJSI index (world) represent sustainability leaders of the industry and therefore are seen as typical examples of companies that gain competitive advantage from sustainability marketing. Derived from this, it can be proposed that the sustainability marketing of worse performing companies would utilize sustainable value concept in marketing to lesser extend com-

pared to the sustainability market leaders. To gain deeper understanding of the sustainability marketing and to further strengthen and validate the conclusions drawn in this study, it is recommended to research the sustainability marketing strategy of such companies that don't perform well on one or more of the three pillars of sustainability. Similar studies on other industries as well as consumer markets are suggested as well.

The study noticed a lack of research in clean technology and BoP strategy communication. Same topics suffered from limited data in this study as well. Promotion and marketing communications is an important part of the product marketing mix. Further studies recommended to advance the knowledge and product adoption on the markets.

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