

Blurring Boundaries

The Role of Sustainability Reporting as a Boundary Object in
FMCG Supply Chains

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Lund University Centre for
Sustainability Studies



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Abstract

Purpose: The sustainability impacts of supply chain practices have become a topic of contention, and customers are demanding more information on the sustainable performance of corporate entities. Sustainability reporting has emerged in response to these concerns as a method to showcase the sustainability performance a company's supply chain to relevant stakeholders. However, research on the topic is still limited in scope, with most studies carried out from a business standpoint, and not from a holistic perspective. This thesis aims to fill this knowledge gap by assessing the potential role of sustainability reports as boundary objects between supply chain stakeholders. The study reviewed the sustainability reports of a set of fast moving consumer goods (FMCG) companies.

Methodology: The methodology for this thesis consisted of three different sections. A quantitative review of past literature was used to identify gaps in previous research. The content of the reports was assessed using a directed content analysis, which was based on previous theory on sustainable supply chains. Finally, a database search was used to determine the level of disclosure of each company, focusing on adherence to reporting standards and external assurance of the reports.

Results: The results showed that there is a gap in theoretical knowledge regarding supply chains and sustainability reporting, with little research existing on the role of sustainability reports as boundary objects. The content of all reports consistently emphasized the environmental dimension of sustainability, but results varied in regards to the economic and social dimensions as well as in the use of performance indicators to address sustainability; with the economic dimension being the least considered by a large margin. The level of disclosure of the reports also varied, as some companies ensured the validity of their reports by seeking external assurance on their adherence to the reporting guidelines, while others presented a less rigorous approach.

Discussion/Contribution: It was concluded that there is a demand for these reports, and thus potential gain for the business, but for them to serve as effective boundary objects they must offer a transparent and comprehensive view of the companies' sustainability performance that reflects the needs of all stakeholders. A framework was proposed to improve the reporting process, which emphasizes integration of stakeholders into the reporting process and external assurance. Sustainability reporting presents great potential in blurring boundaries between the stakeholders of the supply chains of FMCG companies. However, that potential is yet to be fully developed.

Keywords: *Sustainable supply chains, fast moving consumer goods, sustainability reporting, global reporting initiative, boundary objects, stakeholders, triple bottom line, content analysis*

Word Count: 13802

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1 Introduction

In recent decades, many industries have placed an increasing emphasis on the management of supply chains, which have come to be regarded as guarantors of good practice for many companies (Jacobides, Knudsen, & Augier, 2006). Supply chains have been singled out as a roadblock to improved sustainability performance within industry, with large companies leading the move to improved supply chain sustainability (UNGC, 2013). There has been a steady increase in the public concern about the sustainability impacts of supply chains in recent years, with much of the scrutiny faced by companies relating to the growing demands of environmentally friendly practices made by stakeholder groups (Vachon & Klassen, 2006). Much research has been carried out to address these concerns, both corporate and academic (Linton, Klassen, & Jayaraman, 2007), most of which has focused on the environmental impacts of supply chains, but less has been accounted for in terms of economically and socially sustainable performance. Together, the environmental, economic and social dimensions of sustainability form what is commonly referred to as the triple bottom line of sustainability (Henriques & Richardson, 2013).

Concerns about sustainable performance have led many companies to produce sustainability reports as a method of communicating information to stakeholders about the environmental, social and economic impacts caused by its operations. The number of companies disclosing sustainability information in the form of a “public” report has steadily increased in the past few years (Ernst & Young, GreenBiz, 2013). The reports serve as a connector between stakeholders¹ and the company, and aid in achieving communication across the boundaries that separate them. Sustainability reports also show the company’s values and commitment to sustainable performance by demonstrating the integration of sustainability principles throughout their strategy (GRI, 2013).

There is progress to be made in the study of sustainability reporting and supply chain management, as past studies identify a lack of theoretically based research on the fields. Theoretical framing in the study of supply chain sustainability has been identified as a gap in the current knowledge of supply chains (Seuring & Müller, 2008), and previous research has also discussed the lack of theoretical anchors in studies concerning sustainability reporting (Hahn & Kühnen, 2013). These gaps must be filled for sustainability reporting to achieve its full

¹ The main supply chain stakeholders are customers, suppliers, law enforcers, investors and NGOs.

potential in communicating sustainable supply chain performance to stakeholders. As such, the content of the reports must be studied in the context of a theoretical framework to ensure it provides comprehensive accounting of the triple bottom line of sustainability, and the development process of the reports must be reviewed to assess the level of commitment of the reporting companies. The theoretical framing for this research is grounded in the concept of boundary objects, which describe information that is interpreted differently by several parties, but is robust enough to maintain a common identity cross them (Star & Griesemer, 1989). The concept of boundary objects is applied to sustainability reporting in order to assess the effectiveness of the latter in divulging sustainability information to supply chain stakeholders.

The sustainability reports of a set of global fast moving consumer goods (FMCG) companies will be reviewed to determine their potential role as boundary objects between supply chain stakeholders. The FMCG industry is used as a case because of its global market size and dynamic pace that characterizes its supply chains, which incur impacts in all three dimensions of the triple bottom line of sustainability, and makes their appropriate management a crucial factor in promoting sustainable behavior.

1.1 Research Questions and Aims

The aim of this thesis is to assess the potential role of sustainability reports as boundary objects between supply chain stakeholders in the FMCG industry. The research will contribute to theoretical knowledge on sustainable supply chains and sustainability reporting, and help fill the research gap on theoretical understanding of supply chain sustainability. The findings of this research will be used to produce recommendations for improving the development of sustainability reports to contribute to better communication of sustainable supply chain performance. To explore the aim, three research questions are posed (RQ):

- **RQ1:** *How has research on the topics of sustainable supply chains and sustainability reporting developed over time?*

The existence of a gap in the theoretical research of supply chains and sustainability reporting will be identified. Awareness of the role of boundary objects in addressing sustainability in supply chains will be investigated by attending to the recent evolution of these topics in academic research.

- **RQ2:** *How does the content of the sustainability reports of FMCG companies reflect the triple bottom line of sustainability?*

The content of the reports will be analyzed to determine if it portrays a comprehensive view of the triple bottom line of sustainability, which will show whether the stakeholders of the supply chain receive a complete view of the company's sustainability performance.

- **RQ3:** *What is the level of disclosure of the selected reports?*

Effective boundary objects must communicate information in a systematic manner and must involve and reach all stakeholders. The development process of the sustainability reports will be studied by looking for indicators of the level of commitment of the company to the disclosure process, such as the adherence to reporting standards and the use of external assurance.

1.2 Thesis Structure

The following sections introduce the background and theoretical knowledge (sections 2 and 3 respectively), the research design and methodology (section 4), the results of the research (section 5), the discussion of the results (section 6) including the framing of sustainability reports as boundary objects in supply chains, and the conclusions reached (section 7).

2 Background

2.1 Supply Chain Management

A business supply chain is a system that comprises all actors, activities, information and resources necessary for delivering a product or service to the end customer (Seuring & Müller, 2008). The objective of a supply chain is to deliver the right product, to the right place, at the right time, for the right cost. The concept of supply chain management first appeared in the 1980's, but the fundamental assumptions behind it are significantly older (Cooper, Lambert, & Pagh, 1997). Several management techniques have emerged over time, most notably lean, agile and resilient (Carvalho, Duarte, & Cruz Machado, 2011); culminating with the development of sustainable supply chain management. For more information on lean, agile and resilient supply chains refer to appendix 9.2.

The increasing complexity of supply chains as a result of globalization makes them difficult to manage. Over time new institutions of governance have emerged, such as transnational companies, and governance power has shifted from the national towards the global level (Kates & Parris, 2003). Thus, the supply chains of companies operating on a global scale have a responsibility to improve their sustainability performance as their influence and power increases. The sustainable management of supply chains is crucial to avoid transgression of the planetary boundaries within which humanity can operate safely (Rockström et al, 2009).

2.2 Sustainable Supply Chains

A global supply chain has an impact on all three dimensions of sustainability: environmental, economic, and social (Gimenez, Sierra, & Rodon, 2012). Appropriate management is required to mitigate these environmental impacts, while still maintaining economic profitability that does not affect those involved with the different supply chain processes in a negative way. It is important to integrate the sustainability management strategy of the company into the entire supply chain, as this is only way to truly achieve a sustainable supply chain while maintaining a competitive advantage in the marketplace (Zhu, Sarkis, & Lai, 2008)

A study carried out by Seuring and Müller (2008) shows the increase in number of academic publications covering the topic of sustainable supply chains since 1994. The field of study has grown steadily since the early 1990s, which serves as an indicator of its importance (Seuring & Müller, 2008). Although several definitions of sustainable supply chains exist, the most complete was the one developed by Ahi and Searcy (Ahi & Searcy, 2013):

“The creation of coordinated supply chains through the voluntary integration of economic, environmental, and social considerations with key inter-organizational business systems designed to efficiently and effectively manage the material, information, and capital flows associated with the procurement, production, and distribution of products or services in order to meet stakeholder requirements and improve the profitability, competitiveness, and resilience of the organization over the short- and long-term.” This definition encompasses all three aspects of the triple bottom line of sustainability; these are economic, environmental and social considerations. The definition also accounts for stakeholder needs and performance factors, so important to traditional supply chain management. The literature reviewed shows a consensus that sustainable management of the supply chain is a crucial factor in achieving sustainability within industry.

Changes in environmental policy have served as the main external pressure to induce sustainable change in supply chains (Seuring & Müller, 2008). This, coupled with increased customer awareness about environmental issues has led to the emergence of the concept of sustainable supply chains. There are two key drivers of supply chain sustainability. These are policy and pressure from stakeholder communities (Figure 1).

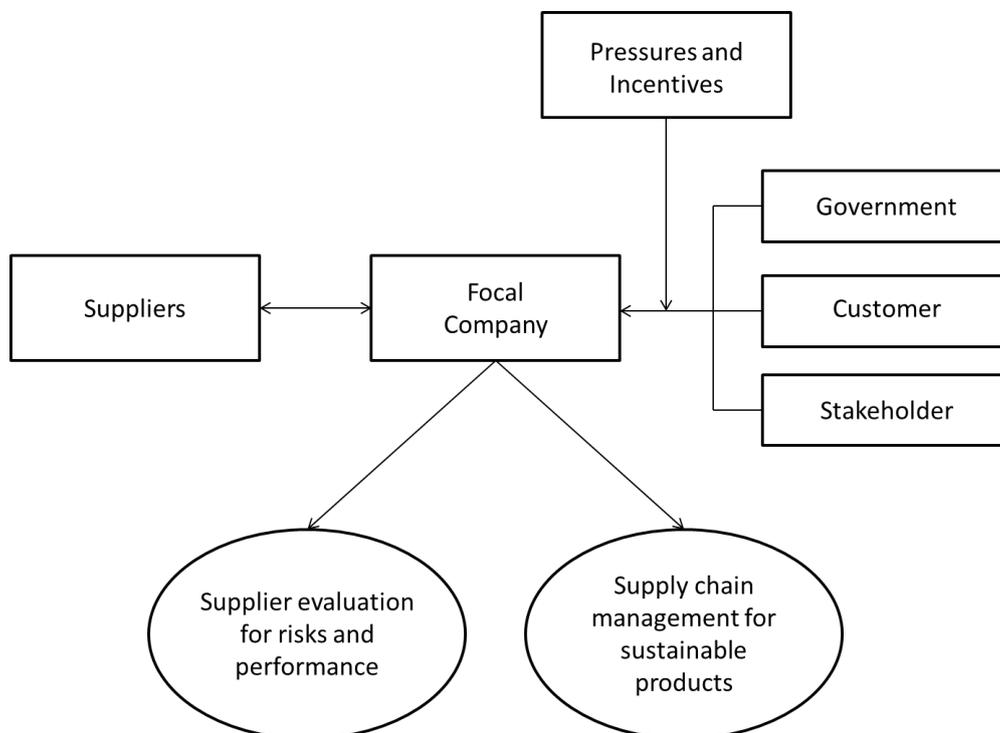


Figure 1. Triggers for sustainable supply chain management. External pressures from stakeholders are incentives for sustainable performance, which leads to the company to change its strategy (Seuring & Müller, 2008).

Customers, governments and other stakeholders exert pressure on and offer incentives for the company to change their performance. This pressure is passed on to the company’s suppliers,

as studying the overall supply chain or life-cycle of a product requires the company to look at a longer part of the supply chain than is traditionally needed for economic reasons (Kogg, 2003). Two complementary strategies are identified by Seuring and Müller (2008) in addressing sustainability issues: the first, named “supplier evaluation for risks and performance”, is concerned with improved management of the company’s supplier relationships, whereas the second, “supply chain management for sustainable products”, manages the life-cycle impacts of the company’s products.

Seuring and Müller (2008) reviewed articles on the topic of supply chain management, and found two major shortcomings with the existing research. The first one was that sustainable development within the field is often reduced to environmental improvements, which is a simplistic definition of sustainability, particularly for a system that comprises large economic and social aspects. The second is the lack of theoretical background in much of the past research. There is an abundance of numerical and empirical research; however, social aspects and system dynamics are often difficult to measure in a quantitative manner (Seuring, 2012).

2.3 Fast Moving Consumer Goods

The FMCG industry produces low cost goods that are sold quickly and often in large quantities, and typically have a relatively small profit margin. They include food products, packaged goods, toiletries and household items (About FMCG, nd). These goods are typically purchased in supermarkets and grocery stores by small-scale end consumers. The supply chain for FMCG focuses on achieving efficient supply and setting up reliable distribution channels as these products have a short shelf life and require rapid replenishment. The large and global market size of the industry and the dynamic fast paced nature that characterize its supply chains make FMCG companies a good case study for supply chain sustainability.

2.4 Sustainability Reporting

Sustainability reporting is a tool that helps increase transparency and accountability in the sustainability dimensions that traditional financial reporting does not cover, these include the linkages between environmental, social and economic performance (INTOSAI, 2013). A sustainability report is a platform for disclosing sustainability performance of a company and its impacts, whether these are positive or negative. Producing a sustainability report requires companies to set up a reporting cycle which monitors and measures sustainability performance on an ongoing basis. Sustainability reporting is a vital resource for managing sustainable change (GRI, 2013).

Since the 1990s the number of companies publishing information on their sustainability policies and impacts has increased substantially (Kolk, TRENDS IN SUSTAINABILITY REPORTING BY THE FORTUNE GLOBAL 250, 2003). In 1992 the number of non-financial reports produced on a global scale was less than 50, a number that is much higher today. While this trend is encouraging, the amount of companies producing these sustainability reports is still small when compared to total 82,000 transnational corporations operating globally (UN, 2009). In 2011, 95% of the world's 250 largest companies produced sustainability reports. However, less than 10% of all publicly traded companies and transnational reported on their sustainability practices (KPMG , 2011).

Public opinion increasingly links the recent economic crisis with sustainability issues, and so the crisis has renewed interest in corporate regulation, which includes corporate responsibility and disclosure requirements. In fact, analysts are starting to assess investor value through the information provided in sustainability reports (Radley Yeldar, 2012). Stakeholders such as the general public, NGOs and corporate investors are all demanding increased involvement of governments in the field of sustainability reporting (Edelman, 2009).

Much of the information included in sustainability reports is voluntarily disclosed by the company. However, these reports can also serve to fulfill legal disclosure requirements that the company is bound to. Some governments and stock exchanges have promoted sustainable performance by enforcing laws that mandate disclosure of sustainability information in the form of a report (Serafeim & Ioannou, 2011). The mandatory requirements for disclosure are dependent on the geographical location the company operates in, as they vary between countries (UNEP, GRI, KPMG et al, 2010). Today, the relationship between voluntary and mandatory reporting is largely regarded as complementary, with the minimum requirements for disclosure determined by regulatory bodies, and the further disclosure being voluntarily carried out by the companies based on international reporting standards. This relationship between voluntary and mandatory reporting is displayed in Figure 2.

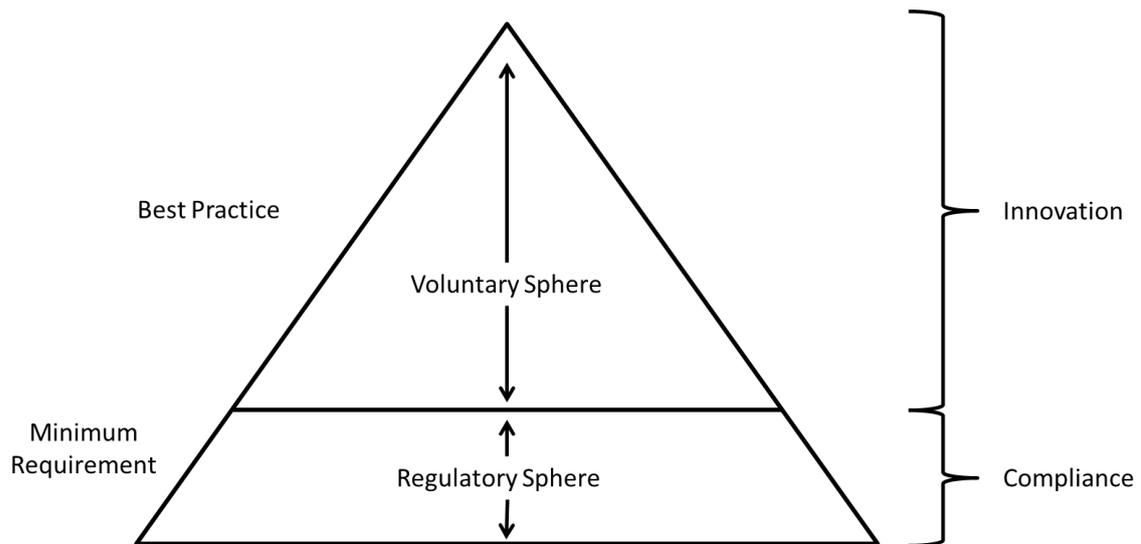


Figure 2. Relationship between voluntary and regulatory sustainability reporting. The regulatory sphere mandates the minimum reporting requirements that companies must comply with. The voluntary sphere comprises reporting that is carried out voluntarily by companies, and it reflects innovation and good practice (UNEP et al, 2010).

2.4.1 Global Reporting Initiative

The Global Reporting Initiative (GRI) is the most widely adopted framework in corporate sustainability reporting. The following quote describes the GRI and its operations, and was taken from the 2011/2012 GRI Annual Report (GRI, 2012):

“GRI is a not-for-profit organization that produces sustainability reporting guidance. GRI’s Sustainability Reporting Framework consists of the Reporting Guidelines, sector guidance, and technical protocols. The Framework is provided online as a free public good. It is used by organizations of all sizes, sectors and locations to report their economic, environmental, social, and governance performance and impacts. As well as producing the Framework, GRI offers support to organizations to help build their sustainability reporting capacity. This support is provided by training, research and guidance publications, services that make reporting simpler and more effective, and network coordination.”

The GRI process was launched in 1997 to develop guidelines for reporting sustainability with the same level of rigor as those for financial reporting. It was created as a multi stakeholder network to provide a forum for those interested in ESG issues to work together for furthering the advance of the sustainability agenda (UNEP et al, 2010).

The GRI framework for sustainability reporting is a collection of reporting guidance documents designed to help companies develop and gather information for the publishing of sustainability reports. These documents are reviewed and updated periodically to reflect increasing

knowledge in the field of sustainability and changing needs of society (Ernst & Young, BCCCC, 2013). The third and most widely used version of the reporting guidelines, known as G3, was published in 2006. The latest and fourth version, of the guidelines the G4, was published in May 2013 (GRI, 2013).

The GRI application level ratings are voluntarily disclosed by the reporting company, and they represent the level of application of the GRI guidelines. There are three application level ratings, which are displayed in more detail in appendix 9.3. The companies themselves address how the guidelines have been implemented when producing their sustainability reports, and typically assign an application rating, as described by the GRI application level rating system. Ratings are important as they indicate the commitment and resources spent on developing the reports, and are an indicator of transparency.

3 Theoretical Framing

3.1 Boundaries

Sustainability science has produced a significant amount of research on the concept of boundaries (Clark et al, 2011; Cash, Borck & Patt, 2006). This study is grounded in boundary theory, and assesses the potential of the sustainability reports of FMCG companies for blurring the boundaries between stakeholders of their supply chains. The concept of boundary work can be defined as a process of negotiation which aims to create knowledge usable by all communities or stakeholders that converge at the boundary (Clark et al, 2011). This research has focused primarily on the interactions between the scientific and policy realms (Cash et al., 2006; Palmer, 2012), but boundary work includes a broader set of activities, those that attempt to mediate between knowledge and action across different communities (McGreavy et al., 2013).

The concept of communities is important to boundary theory. “Communities of practice are the basic building blocks of a social learning system because they are the social ‘containers’ of the competences that make up such system.” Communities are formed within society, and they share practices that reflect their collective learning. The participants in these communities define what constitutes a competence based on their shared experience (Wenger, 2000). The learning process at a boundary is characterized by a gap between experience and competence, and it occurs when a community is exposed to a foreign competence. When competence and experience diverge, learning opportunities arise; a foreign competence allows for new experience to be created by interacting with other communities. A problem can arise if the boundary is too porous and fact and opinion start to mix, causing the knowledge generated to lose value (McGreavy et al., 2013). However, if the distance between them is too great then the learning process is hindered (Wenger, 2000).

Effective boundary work takes into account three key attributes. The first is participation by stakeholders and communities; the second is governance schemes for accountability to stakeholders; and the third is the production of boundary objects (Clark et al, 2011). Boundary objects serve to align competencies and experience between communities and create shared value between them. They are defined as collaborative efforts which “are both adaptable to different viewpoints and robust enough to maintain identity across them” (Star & Griesemer, 1989). As such, boundary objects are plastic entities that sit between communities and can be interpreted differently within each for specific purposes, but have fixed content or structure that maintains their integrity (Star & Griesemer, 1989).

Boundary objects do not have a set structure, as they can take multiple forms (Wenger, 2000):

- Artifacts: they are tools, reports or models. A resource created jointly for the use of all communities involved.
- Discourses: they are common languages or standardized rules that allow for negotiation across boundaries.
- Processes: the use of shared processes between communities allow for cross-boundary coordination.

Sustainability reports can serve as boundary objects between the different stakeholder communities of a supply chain. Previous research suggests that not only do audiences for sustainability reports exist; but they are keen to learn about the sustainability performance of the company and open to being influenced by reports (KPMG, 2008). This situation presents an important opportunity for the company to actively engage with stakeholders and provide information that meets their needs. There is potential for establishing a dialogue and coordinating with willing stakeholders. The reports present information on company performance based on indicators set in reporting guidelines for different purposes, and reflect the needs of different communities. They have a set structure based on standardized guidelines, but the use of the knowledge they provide differs depending on the agenda and competencies of the interpreter. Thus, from the perspective of boundary objects, sustainability reports can be thought of as a means to cross boundaries and carry information, discourses and priorities across stakeholder communities (Holden, 2013).

Sustainability reports and the processes their development are examples of all three types of boundary objects listed above Wenger (2000). The reports themselves are immutable artifacts that present information meant for several stakeholders. These reports are created based on a common language, which is the disclosure standards on which the reports are based. Finally, the process of developing the reports based on standards can be a coordinated effort between the company and its stakeholders by making use of stakeholder panels.

The boundary effects of boundary objects can be measured by assessing coordination of the development process, the transparency of the information included, and the negotiability between communities at the boundary (Wenger, 2000). Coordination engages communities in defining the needs of all parties, and by bringing different types of expertise to the development of a boundary object, negotiability between parties is encouraged, and the legitimacy of the information is enhanced by providing stakeholders with more transparent information (Cash et al, 2003).

The motivations for reporting are (Ernst & Young, BCCCC, 2013):

- **Transparency with stakeholders**, identified as the most persistent motivating factor for production of sustainability reports. Framing the reports as boundary objects is in line with the desire of companies to coordinate with stakeholders and increase transparency of their disclosed information.
- The **potential competitive advantage** offered by differentiation through publication of comprehensive reports that placate stakeholder concerns is also a driving force behind their development.
- **Risk management** is also an incentive to reporting, because the benefits of collecting extensive information on the company's operations are plentiful for managerial purposes; in fact 61% of sustainability managers list risk management as one of the top three reasons for the sustainability activities of their company.

Sustainability reporting offers value to both the company and its stakeholders. Improved reputation with stakeholders was listed by over 50% of respondents of a survey as a positive consequence of sustainability reporting for the reporting company (Ernst & Young, BCCCC, 2013). The publication of the reports also had the effect of improving relationships with stakeholders; with increased employee loyalty, increased trust from consumers and improved relationship with regulatory bodies among the benefits identified (Ernst & Young, BCCCC, 2013). Companies engaging in sustainability reporting can simultaneously increase their success and reduce negative social influence. Fernández-Kranz & Santaló (2010) even extend their potential influence further, and suggest that they can benefit society at large. Improvements in the internal management of the company have been listed, helping the company refine its corporate strategy, and leading to the reduction of waste and other costs within the company's supply chain. These reports are a valuable source of information for stakeholders, highlighting the importance of transparency in their development (Ernst & Young, BCCCC, 2013).

Identifying the economic, environmental and social expectations of stakeholders is crucial as they dictate both the behavior stakeholders consider acceptable, and the information they require to judge the company based on these expectations (Deegan & Unerman, 2006). It is only once the company knows the issues its stakeholders regard it responsible for that it can produce a report to address these issues (Unerman, Bebbington, & O'Dwyer, 2010).

The main stakeholder communities in the case of supply chains within the FMCG industry are customers, suppliers, law enforcers, investors and NGOs as shown in Figure 3. These are individual communities with their own particular competencies, experience and needs.

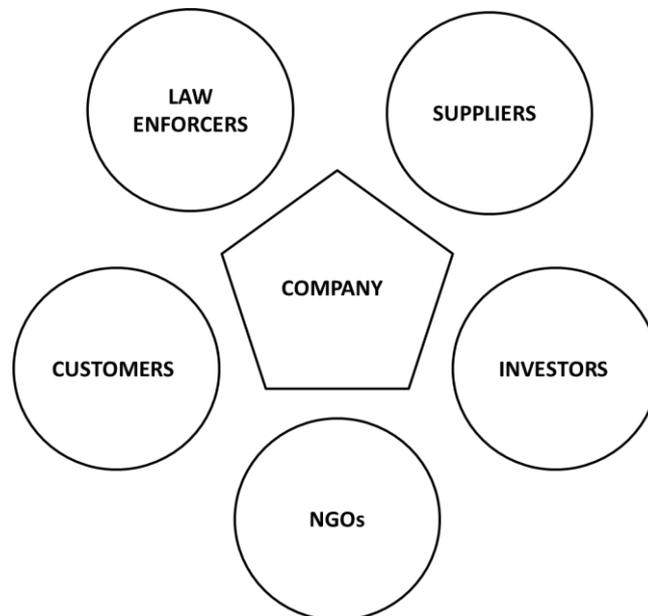


Figure 3. Main stakeholders sharing a boundary with the company. Suppliers, customers, and law enforcers are the main stakeholders that share a boundary with the company (own figure).

Boundaries exist between the company and its stakeholders:

- **Between the company and consumers:** Customers are increasingly concerned with sustainability issues. Therefore, proving good performance of the company through voluntary reporting serves to appease this concern. In turn, the company can gain a competitive advantage by satisfying the desires of customers.
- **Between the company and suppliers:** The process of developing the report itself helps these entities to align their strategies and to better understand each other's sustainability performance. This process requires the company and its suppliers to exchange information and understand the impact of their joint supply chain.
- **Between the company and law enforcers:** Sustainability reports are voluntary in nature, but typically include certain information that the company is legally required to disclose, particularly within the environmental dimension. These reports serve to fulfill legal the requirements of the company regarding information disclosure, and are a tool for law enforcers to ascertain whether the company operates within legality concerning sustainable performance. The publishing of an extensive report helps the company show their commitment to sustainability by going past the mandatory level of disclosure into voluntary reporting.

- **Between the company and investors:** In a study carried out a survey by the Radley Yedlar communications consultancy with industry investors and analysts, the results concurred that sustainability reports are the preferred sources of investors for retrieving information on environmental and social performance of a company (Radley Yeldar, 2012).
- **Between the company and NGOs:** NGOs represent the outermost circle of individuals affected by the activities of companies, and must be considered as stakeholders from the point of view of sustainability science. NGOs seek to gain knowledge of the company's commitment to sustainable practices from the sustainability reports so that they can pressure the company to improve its sustainability performance (O'Dwyer, Unerman, & Hession, 2005). The company helps appease the concerns of this stakeholder group by showing willingness to disclose information on sustainability performance.

The creation of boundary organizations has been singled out as an incentive to the creation of boundary objects. These organizations exist at the frontier of two communities and involve the participation of all stakeholders from both sides of a boundary (Guston, 2001). The success of a boundary organization is measured by its ability to please the needs of all communities involved, with the success of the organization in performing this task symbolizing the stability of the boundary (Guston, 2001). The boundary organizations that govern sustainability reports are the dedicated reporting teams set up to gather data and carry out the reporting process. Stakeholder focus groups and expert panels also serve as boundary organizations that govern the boundary objects.

3.2 Framework for Assessment of Supply Chain Sustainability

A theoretical framework was developed as the basis for the methodology of RQ2. The framework builds on previously developed theory on sustainable supply chains and firm sustainability (Closs, Speier & Meacham, 2010; Seuring & Müller, 2008; Ahi & Searcy, 2013), and it presents the triple bottom line of sustainability applied to supply chain systems and is shown in Figure 4.

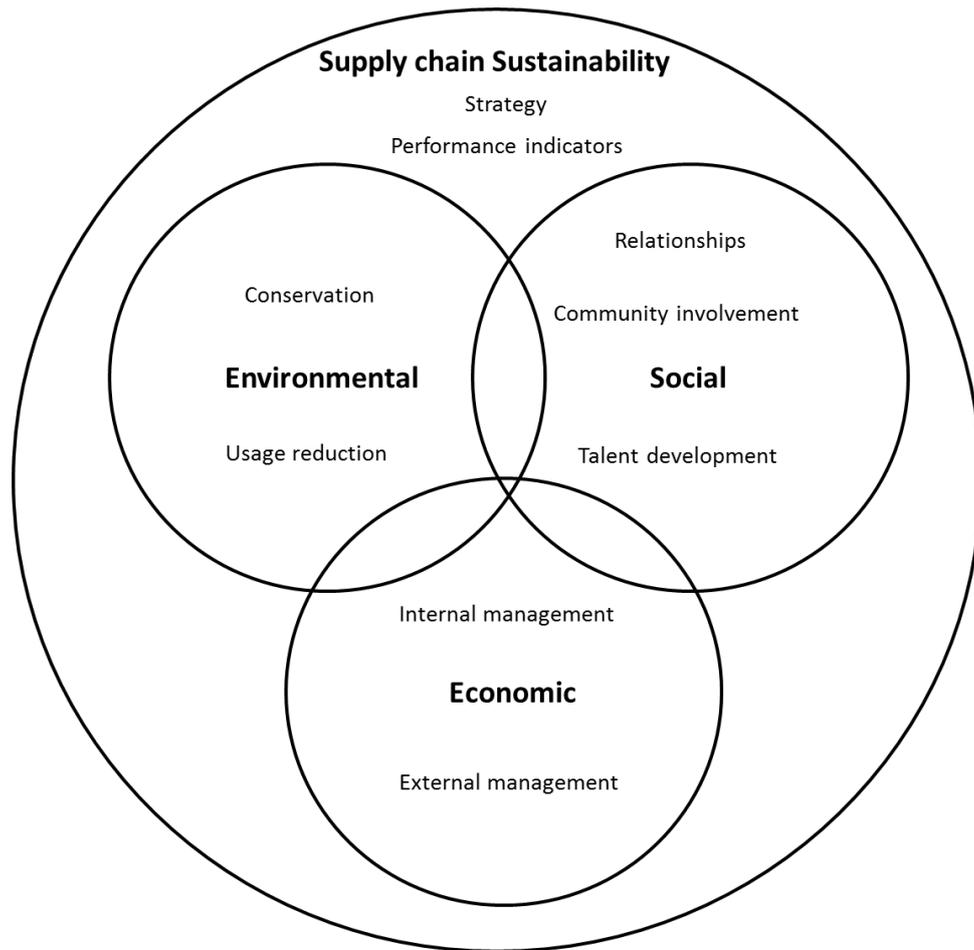


Figure 4. Framework describing sustainable supply chain practices. This framework covers the triple bottom line of sustainability applied to the sustainable performance of supply chains. Each of the three sustainability dimensions (economic, environmental and social) is divided into several categories. Categories that are relevant to all three dimensions are also considered. The framework was elaborated based on the research of Closs et al (2010).

The business and supply chain strategy of a company permeates into all dimensions of sustainability. The strategy is a determinant factor of the future practices of all actors within the supply chain. A successful strategy for sustainable supply chain management will emphasize traceability of the products throughout the supply chain, while monitoring that the sustainability of the practices involved upholds the required standards. This success is measured with the use of performance indicators that represent the different sustainability dimensions.

Economic sustainability is regarded as creating shared value for all involved in the supply chain while at the same time reducing cost and maintaining environmental and social sustainability. The economic dimension of sustainability comprises internal and external management of the company's operations. Internal management focuses on the operations carried out within the boundaries of the company's facilities, with strategic sourcing, continuous improvement of operations and optimization of transport usage being key components in reducing cost and

waste. External management is an extension of internal management, focusing on the management of suppliers and outsourcing of activities to better utilize the capabilities of the company's facilities.

The environmental dimension of sustainability is arguably the one most associated with sustainability. The growing concern of the environmental impacts of supply chain activities has led companies to increase investment in environmental initiatives. The environmental dimension of sustainability comprises the categories of conservation and usage reduction. Conservation refers to the preservation of environmental resources, such as water and energy, and the lessening of the environmental impacts of supply chain practices. Usage reduction is achieved by reducing the amount of waste produced by manufacturing and logistics operations.

Social sustainability considers ethical and educational dimensions. Ethical sustainability is largely referred to as corporate social responsibility (CSR), which are activities related to social development that are outside those the company is legally required to perform. Community involvement of the companies employees with the company's broader community are an integral part of ethical sustainability. Educational sustainability is necessary to ensure to develop the talent that will replace current workers in the future. Sustainable relationships with supply chain actors are crucial to maintaining social sustainability in the long term. These actors can be largely broken down into suppliers, customers and employees, although others exist such as governments and non-profit organizations. The use of codes of conduct for both suppliers and employees is necessary for the company to uphold its sustainability principles throughout the entirety of the supply chain.

4 Research Design

4.1 Epistemology and Ontology

Every research has its own ontology, epistemology and methodology. The first step in designing a database or a knowledge-based system is to select appropriate ontological categories (Sowa, 1995). Ontology was defined as “the study of organization and the nature of the world independently of the form of our knowledge about it” by Guarino (1995). This definition emphasizes the separation between ontology and epistemology. Epistemology is the way that knowledge is created to understand the nature of the world (Oral, 2009). Different epistemological paradigms advocate different forms of knowledge and methodologies.

Research on logistics and supply chain management is largely based on the ontology of realism, and postulates that reality exists independently of the observer. This thesis is largely nested in realist ontology as it asserts that the observations resulting from the research bring knowledge closer to understanding reality. Realism is associated with a positivist epistemology, which focuses on observational research to identify causal relationships (Grubic & Fan, 2010). This is in contrast to the opposing paradigm of interpretivism, which holds that understanding of reality is relative, and depends on the user’s previous knowledge of a system (Grubic & Fan, 2010). Historically, research in the field of logistics and supply chain management was quantitative in nature; however, the increasing complexity of supply chain systems makes it harder to describe them solely following a normative approach.

Authors such as Nilsson (2005) have challenged the positivist assumptions that have characterized research in logistics and supply chain systems. These assumptions include deliberate design, unbiased and noise-free information flows and simplification of the systems for the purpose of efficiency (Nilsson, 2005). The rise of complex sustainable supply chains challenges the established positivist paradigm associated with research in supply chain management. The concept of sustainable supply chains itself is subject to interpretation, and so an interpretivist epistemology is useful in understanding these systems.

The research presented in this thesis falls under both positivist and interpretivist epistemologies, and makes use of a combination of quantitative and qualitative methodologies. Causal relationships are found from observations within the sustainability reports and databases, but these are subject to interpretation based on previous knowledge on sustainable supply chains, as shown in section 3.2. The methodology presented fits within the realm of sustainability science by combining several theoretical frameworks and studying

the fields of sustainable supply chains and sustainability reporting from new perspectives, making use of a combination of qualitative techniques to produce quantitative results.

4.2 Research Questions

Three research questions were posed in section 1.1 with the aim of assessing the potential role of sustainability reports as boundary objects between supply chain stakeholders in the FMCG industry. The questions and the methodology specific to each are shown in Table 1.

Table 1. Overview of the research questions. Included are the three research questions posed to achieve the aim of the thesis, and the methodology specific to each research question.

Research Questions	Methodology
RQ1. How has research on the topics of sustainable supply chains and sustainability reporting developed over time?	Quantitative literature review
RQ2. How does the content of the sustainability reports of FMCG companies reflect the triple bottom line of sustainability?	Directed content analysis and statistical analysis
RQ3. What is the level of disclosure of the selected reports?	Database search

4.3 Methodology

4.3.1 RQ1: Development of Research over Time

The methodology for this research consisted of a quantitative review of existing literature on the topics of sustainable supply chains and sustainability reporting. This was achieved by carrying out a systematic search of keywords on an online database (Google Scholar). The search terms used were: “supply chain”, “supply chain” + “sustainability”, “sustainability reporting”, “sustainability reporting” + “supply chain”, motivation + “sustainability reporting”, “sustainability reporting” + “boundary objects” and “boundary objects” + “supply chain”. The amount of publications including the phrases “supply chain” and “sustainability reporting” anywhere in the text served as an indicator of the importance of the overarching fields of study. The search of associated phrases indicated the importance given to research on more specific concepts within the overarching fields of study. The term *motivation + “sustainability reporting”* was included to assess the importance given to the motivations for developing sustainability reports in previous literature.

4.3.2 RQ2: Triple Bottom Line of Sustainability

A directed content analysis of the corporate sustainability reports of the selected FMCG companies was carried out using a keyword search. The theoretical framework for the directed content analysis was detailed in section 3.2, and was used to determine keywords relevant to each sustainability category. The results from the keyword search were compiled and analyzed using statistical methods to determine how the sustainability reports of FMCG companies reflect the triple bottom line of sustainability. Content analysis as a methodology in studies of supply chain sustainability has been used in studies by Morali and Searcy (2013), Toppinen et al (2012) and Alazzani and Wan-Husin (2013).

4.3.2.1 Materials

The largest companies of the FMCG industry sector (excluding tobacco companies, which present specific issues) were chosen on the basis of their grocery sales. These companies can be categorized into those producing packaged foods and beverages, and those producing toiletries and other household items. Five companies from each category were selected, and one (Unilever) belonging to both. These are the largest global FMCG companies within the aforementioned categories that produce a sustainability publication.

Not all global FMCG companies publish sustainability reports, and so only companies that produce an annual sustainability report were considered for this research. The information was retrieved from consultancy reports such as the Global 50 report by OC&C (OC&C, The Grocer, 2013). Appendix 9.1 presents the eleven companies selected for this study and shows information on their financial performance and the sustainability reports used as materials for this study.

4.3.2.2 Directed Content Analysis

Content analysis is a widely used qualitative research technique that describes a family of analytic approaches ranging from impressionistic, intuitive, interpretive analyses to systematic, strict textual analyses (Rosengren, 1981). As such, content analysis as a technique for qualitative review of information can be carried out in many different ways. A structured approach to direct content analysis was carried out as the methodology to answer this research question, incorporating a quantitative element in measuring the frequency of selected keywords.

Directed content analysis is useful when previous research or theory exists that would benefit from further use or description (Hsieh & Shannon, 2005). This type of content analysis makes a

deductive use of theory with the goal of validating or extending a theoretical framework (Elo & Kyngäs, 2007). The use of existing theory can help focus the research question and provide predictions about the variables in question and their relationships. It is thus useful in determining the initial coding scheme on which to base the data gathering process, which has been referred to as deductive category application (Mayring, 2000).

The theoretical framework described in section 3.2 was used to create an initial coding scheme. This coding scheme breaks down supply chain sustainability into several dimensions, and each of these into several categories. Keywords that represent each category were determined based on the theoretical framework, following which a keyword search was carried out. The selected keywords for each the sustainability dimensions can be seen in appendix 9.3. The frequency of the keywords was recorded in a database for each of the FMCG companies, grouped into their respective categories within the framework. The keyword search was complemented by qualitative analysis of the context under which the keywords were found. Their meaning was assessed before placing them under the relevant categories, which was achieved by assessing the relevance of the mentions found from the keyword search to the categories they represent (Kvale, 2007).

4.3.2.3 Statistical Analysis

The data collected from the content analysis was processed through the use of contingency tables and principal component analysis. A contingency table displays and records relationships between categorical variables. Each row represents a factor level, in this case a company, and each column a response level, in this case the supply chain sustainability categories. Each cell presents a mutually exclusive pair of values.

Principal component analysis (PCA) is a way of identifying patterns in data comprising multiple variables, and also of expressing this data in a way that highlight relationships between the variables. In principal component analysis, the data are replotted based on the eigenvectors and corresponding eigenvalues that explain most of the variance of the data. These are the principal components, which can also be described as the orthogonal (perpendicular) dimensions of the data space that best capture the variance in descending order. The data set is transformed so that the variables are expressed in terms of the patterns between them, where the patterns are the eigenvectors that most closely describe the relationships between the data, the data is now classified as a combination of the contributions from each of those lines (Smith, 2006).

There are as many *eigenvectors*, or principal components, as there are dimensions in the original data set. The data set for this research question has nine dimensions, one for each sustainability category. Each eigenvector explains a percentage of the total variance, with this number decreasing as more principal components are identified. An advantage of PCA is that once patterns have been found in the data, the new replotted data set can be compressed by reducing the number of eigenvectors, thus reducing the number of dimensions, without much loss of information. The correlation method was used in this PCA.

All the reports have different lengths and formats; therefore, absolute frequencies (number of times each keyword is mentioned) are not a comparable measure between the different companies. The absolute frequency was normalized over the different reports over the total number of words in each of the reports to create a standardized and comparable variable, and was then multiplied by 1000, to produce figures that were easier to handle and present. This was achieved by converting the PDF sustainability reports into text files, counting the number of words in each one, excluding indexes, tables of contents, and any other text that was deemed not relevant for the content analysis from the word count.

4.3.3 RQ3: Level of Disclosure of the Sustainability Reports

The methodology for this research question searched the reports for mentions of application of the reporting guidelines and adherence ratings, as well as the GRI database which compiles information for all companies using the framework². The use of an external body to assure the adherence of the report to the GRI guidelines was also be recorded, whether this assurer be the GRI or an external party. Finally, the existence of references in the reports to several established standards associated with sustainability performance was recorded. The results give an overview of how sustainability reporting is carried out within the FMCG industry. Descriptions of the information compiled during the search are presented in appendix 9.2. There exists previous literature addressing the level of disclosure of corporate sustainability reports, with studies such as those by Toppinen et al (2012) and Alazzani and Wan-Hussin (2013) covering the topic.

4.4 Ethical Considerations

The methodology of the research questions consisted of a quantitative literature review, a directed content analysis and a database search. All these methods were carried out

² The database can be found at the following address: <http://database.globalreporting.org/>

individually by the author, with none of them requiring contact with test subjects. The typical ethical considerations associated with research that makes use of interviews and surveys were not a concern. All the literature that was used for this research was appropriately referenced to avoid any plagiarism.

All the materials used are within the public domain. The database used for the quantitative literature review (Google Scholar) carried out in RQ1 is publically accessible. The sustainability reports of the eleven FMCG companies used in RQ2 are all freely available from the companies' webpages, and can also be found in the GRI database. Thus, there is no conflict from the use of the reports or the company names. The GRI database is also available for public use, and was the basis for the database search carried out in RQ3. No consent was required for any of the materials used in this research.

The research was carried out to be reliable, quantifiable and largely reproducible. The qualitative dimension of directed content analysis does not lend itself to reproducibility, as the results as carried out by another researcher would yield somewhat different results. However, the methodology itself is presented in detail and can be reproduced.

5 Results

5.1 Development of Research over Time

Results of the quantitative literature review show that there has been a steady rise in the amount of articles covering both supply chains and sustainable supply chains (Figure 5).

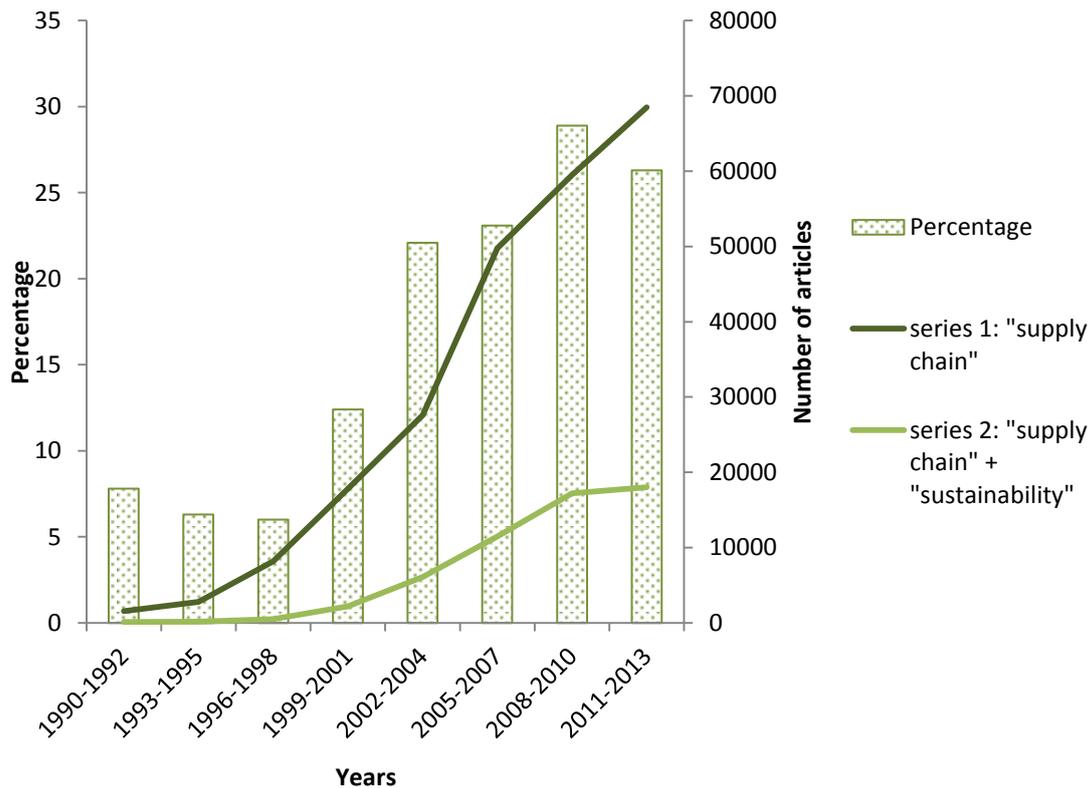


Figure 5. Development of research on the topic of supply chains over time. This figure presents the number of articles resulting from the search of the terms “supply chain” and “supply chain” + “sustainability” over time in Google Scholar.

The percentage of articles in the supply chain field covering sustainability has also increased. The percentage of articles on supply chains concerning sustainability issues was over 25 percent in the time period of 2011-2013 (Figure 5).

Results show that sustainability reporting has experienced an exponential increase in significance within research (Figure 6).

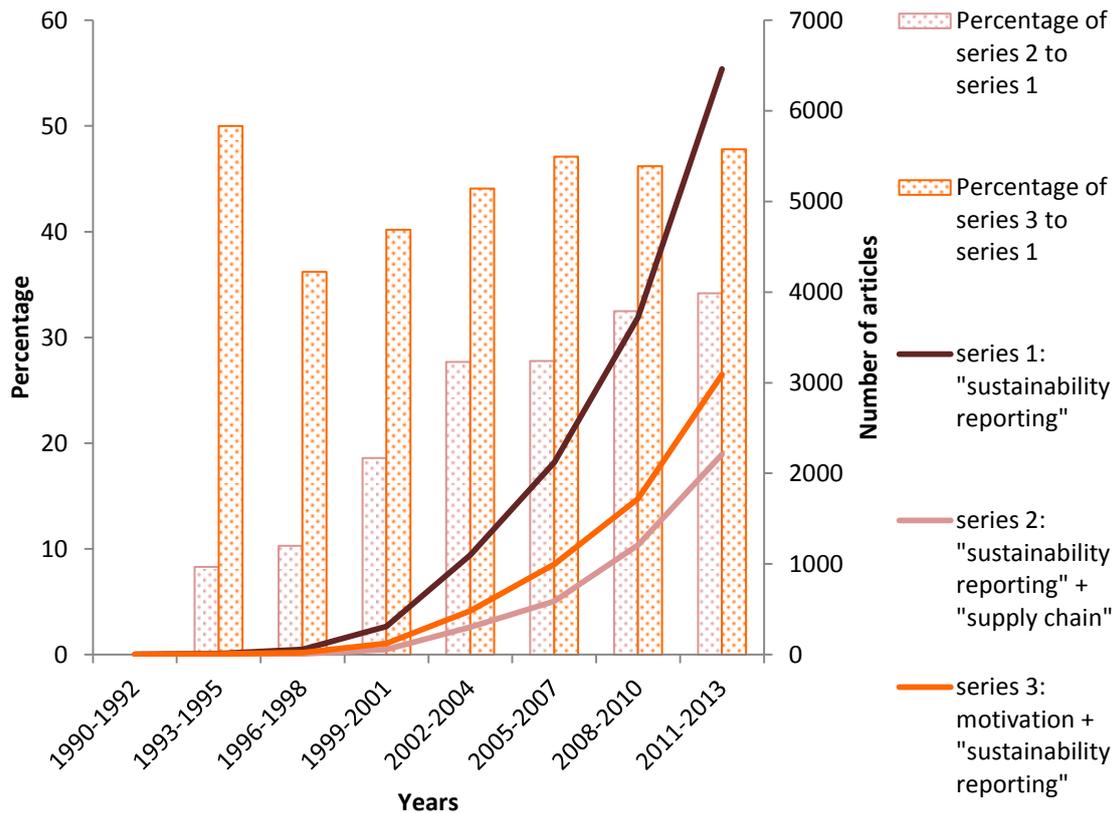


Figure 6. Development of research on the topic of sustainability reporting over time. This figure presents the number of articles resulting from the search of the terms “sustainability reporting”, “sustainability reporting” + “supply chain” and motivation + “sustainability reporting” over time in Google Scholar.

Sustainability reporting as applied to supply chains has also increased over time, with over 30 percent of the publications on sustainability reporting referencing supply chains in the time period of 2011-2013 (Figure 6).

Since 2001 over 45 percent of the articles concerning sustainability reporting have accounted for the motivations behind their development. More concretely, transparency with stakeholders has been consistently identified as the most persistent motivating factor for production of sustainability reports (Ernst & Young, BCCCC, 2013). The potential competitive advantage offered by differentiation from competitors through publication of the is also a driving force behind their development. Transparency is a motive that ultimately benefits the company, as sustainability reports are the preferred source for potential investors to retrieve information on environmental and social performance of the company (Radley Yeldar, 2012).

Results also show that the number of publications the concept of boundary objects as applied to supply chains has significantly increased over time (Figure 7), with a peak of 361 articles during the 2011-2013 period.

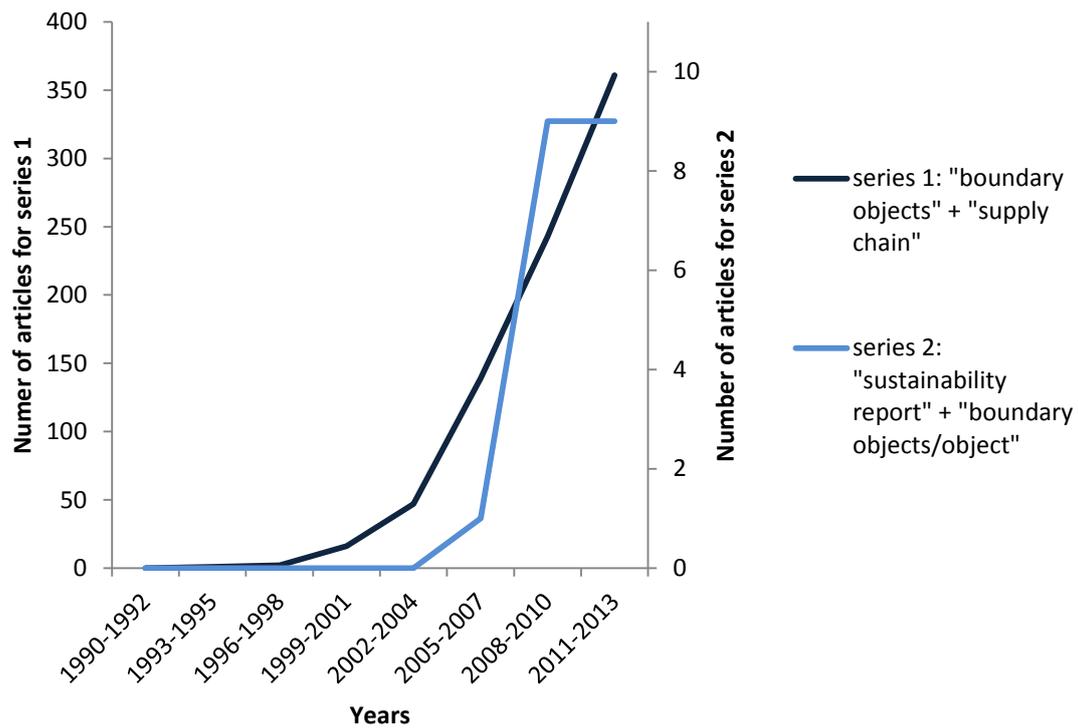


Figure 7. Development of research on the topic of boundary objects over time. This figure presents the number of articles resulting from the search of the terms “boundary objects” + “supply chain” and “sustainability report” + “boundary object” over time in Google Scholar.

The number of articles covering both supply chains and boundary objects, however, is much smaller than the number of articles found for research on supply chains and sustainability reporting (Figure 6). This shows that research on the topic of boundary objects is currently but a fraction within the study of supply chains. The number of articles found for publications framing sustainability reports as boundary objects was much smaller; only 9 publications were found in the last two time periods, and it was almost non-existent before (Figure 7). This finding reinforces the notion that there is a knowledge gap in theoretically based research of supply chains, and boundary objects are increasingly being used as theoretical anchoring. The potential of sustainability reports to act as boundary objects so far remains largely untapped.

The raw data gathered from the quantitative literature review used in this section presented in appendix 9.6.

5.2 Triple Bottom Line of Sustainability

The results from the content analysis for the triple bottom line of sustainability are displayed in Table 2. The total number of mentions of keywords corresponding to each sustainability dimension is shown as an aggregate number.

Table 3. Results from the directed content analysis: counts for each supply chain sustainability category. The number of keywords found under each sustainability category was normalised over total number of words of the corresponding report for each company.

Companies	ALL DIMENSIONS		ECONOMIC		ENVIRONMENTAL-
	Performance indicators	Strategy	External management	Internal management	Conservation
AB Inbev	0.404	0.748	0.575	0.408	1.615
Coca Cola Company	0.290	1.056	0.819	0.254	1.423
Colgate Palmolive	0.609	1.128	0.508	0.283	1.564
JBS	0.799	1.007	0.054	0.465	0.877
Johnson & Johnson	0.431	0.988	0.261	0.226	0.807
Kimberly Clark	0.337	1.759	0.365	0.284	1.111
L'Oreal	0.425	0.704	0.148	0.323	0.645
Nestlé AG	0.454	1.112	0.613	0.546	1.489
PepsiCo	0.595	1.304	0.336	0.235	1.335
Procter & Gamble	0.522	0.960	0.558	0.362	1.216
Unilever	0.946	0.649	0.523	0.377	0.903
Grand Total	5.812	11.415	4.76	3.763	12.985

Table 3. (continued)

Companies	ENVIRONMENTAL		SOCIAL		Grand total
	Usage reduction	Community involvement	Relationships	Talent development	
AB Inbev	1.079	0.602	0.775	0.963	7.169
Coca Cola Company	0.884	0.263	1.153	0.299	6.441
Colgate Palmolive	1.157	0.49	1.646	0.737	8.122
JBS	0.678	0.215	0.722	0.411	5.228
Johnson & Johnson	0.517	0.257	1.794	0.854	6.135
Kimberly Clark	1.313	0.283	1.353	0.750	7.555
L'Oreal	0.635	0.292	1.061	0.706	4.939
Nestlé AG	0.744	0.264	1.250	0.426	6.898
PepsiCo	0.790	0.35	1.368	0.572	6.885
Procter & Gamble	1.223	0.230	1.622	0.657	7.35
Unilever	1.479	0.100	1.035	0.135	6.147
Grand Total	10.499	3.346	13.779	6.51	72.869

A comparison between the results of food and beverage companies and toiletries and household goods companies (see Table 7 in appendix 9.1) was summarized in Figure 9.

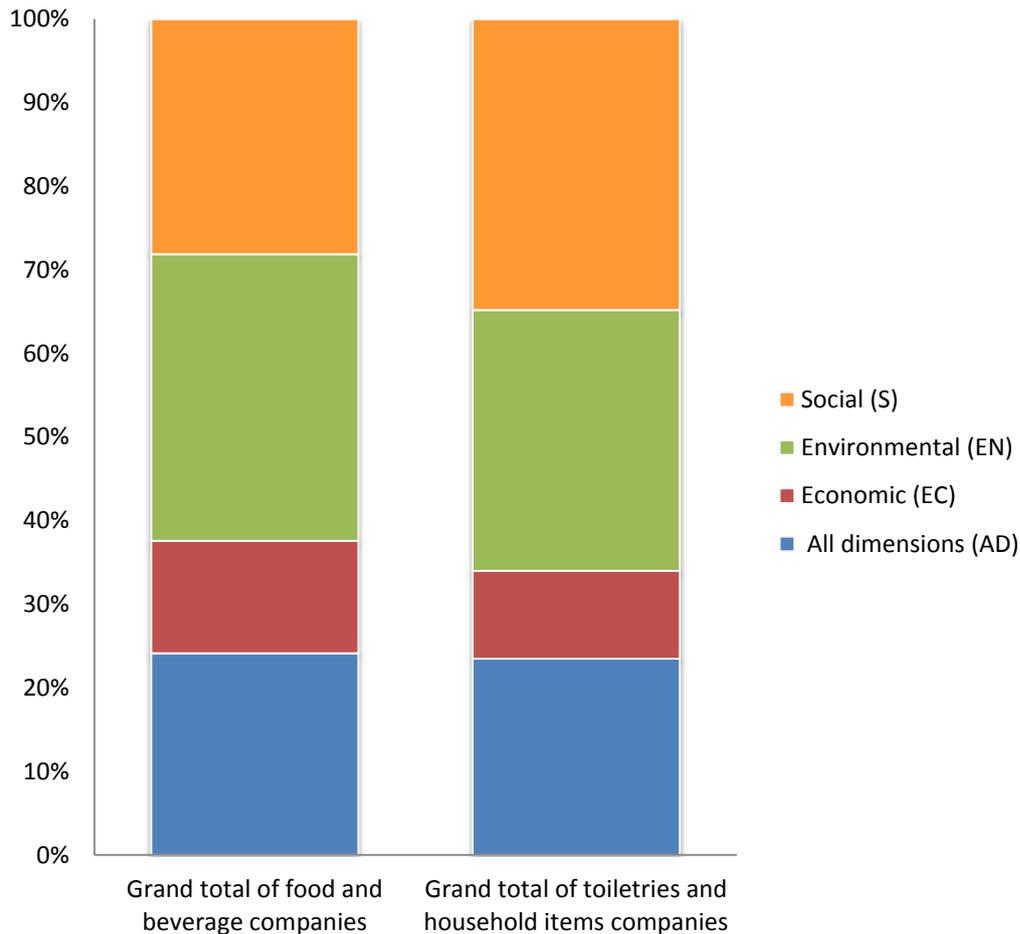


Figure 9. Results from the directed content analysis: comparison between FMCG companies. The results for each sustainability dimension grouped by the two different types of FMCG companies. These are food and beverages companies and toiletries and household goods companies. The results for each dimension are shown as a percentage of the total sum of the results for each company type.

Unilever was considered to belong to both types of companies, as its produces a broad range of goods that are characteristic of both. This comparison does not show any large discrepancies in supply chain sustainability reporting between the two types of companies, with all dimensions presenting rather similar results. Overall, food and beverages companies considered the environmental and economic dimensions more than the companies producing toiletries and household goods; however the latter considered the social dimension more than the former. Both considered the categories relevant to all dimensions equally. Since the comparison between the two types of companies did not yield any noteworthy discrepancies between them, the ensuing analysis will not consider the companies by type, but will consider them as equally representative of the FMCG industry.

Results show that the social and environmental dimensions of sustainability are by far the most considered on average by the companies (Figure 10), with results of 23.635 and 23.484 counts respectively (Table 3). The categories of performance indicators and business strategy

which are relevant to all dimensions resulted in a result of 17.227 counts. Economic sustainability practices were the least considered in the reports, with a total result of 8.523 counts.

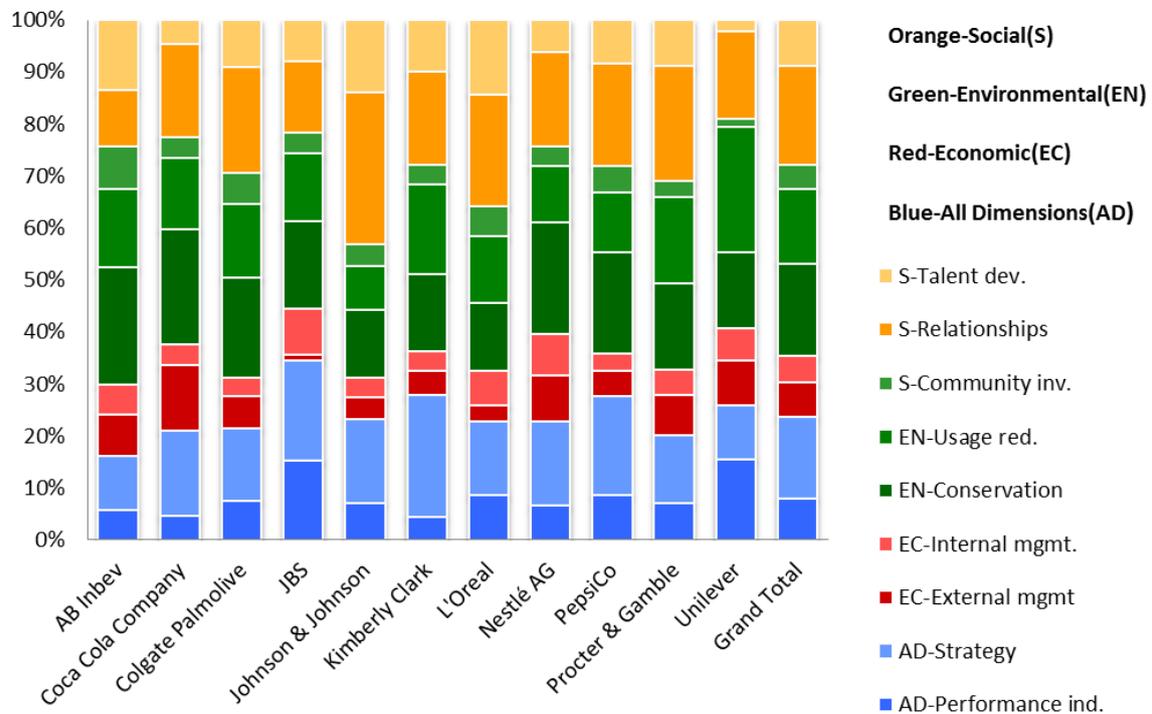


Figure 10. Results from the directed content analysis: sustainability categories. The results for each supply chain sustainability dimension are shown as a percentage of total results for each FMCG company.

The largest categories overall were strategy, conservation, usage reduction and relationships. The results show that these are consistently large throughout all the companies. The smallest categories overall are the economic sustainability categories, internal and external management, and the social category of community involvement.

Unilever and JBS considered performance indicators to a higher degree than the other companies, while Coca Cola considered external management in the highest percentage of all the companies. The Coca Cola Company is known for its extensive supply chain which reaches even remote markets with difficult access.

JBS barely considered the sustainability of its external management operations; however it had the highest percentage of internal management of all the companies. This discrepancy between the two economic sustainability categories could possibly be due to JBS being a rising company, with less focus on outsourcing and supplier activities that characterize external management. Johnson & Johnson showed the least consideration of the environmental

dimension, and the highest consideration of the social dimension, in particular the relationships category.

Results for the first three principal components are shown in Table 4. The first and second principal components are the most significant, and they are plotted against each other in Figure 11. The first three principal components explained over 70% (a proportion of 0.707) of the variance of the results from the content analysis.

Table 4. Results for the principal component analysis: proportion of variance. The proportion of the variance of the content analysis results explained by each of the first three principal components.

	Component 1	Component 2	Component 3
Proportion of Variance	0.309	0.228	0.171
Cumulative Proportion	0.309	0.536	0.707

Table 5 shows the contribution, or loading, of the sustainability categories to each of the first three principal components calculated. The larger the absolute value of the loading of a variable (i.e., regardless of sign) the more importance it bears for that component. For instance, the first component is dominated by the contrasting performance of variables performance indicators and internal management vs. all other variables except Usage reduction, which has no loading for the first component.

Table 5. Results from the principal component analysis: loadings. The loadings of the supply chain sustainability categories under principal components 1, 2 and 3 from the principal component analysis.

	Component1	Component 2	Component 3
AD-Performance ind.	-0.453	0.120	0.000
AD-Strategy	0.283	-0.116	-0.359
EC-External mgmt	0.229	0.547	-0.214
EC-Internal mgmt.	-0.261	0.326	0.388
EN-Conservation	0.382	0.484	0.000
EN-Usage red.	0.000	0.426	-0.346
S-Community inv.	0.438	0.103	0.435
S-Relationships	0.285	-0.234	-0.487
S-Talent dev.	0.419	-0.292	0.317

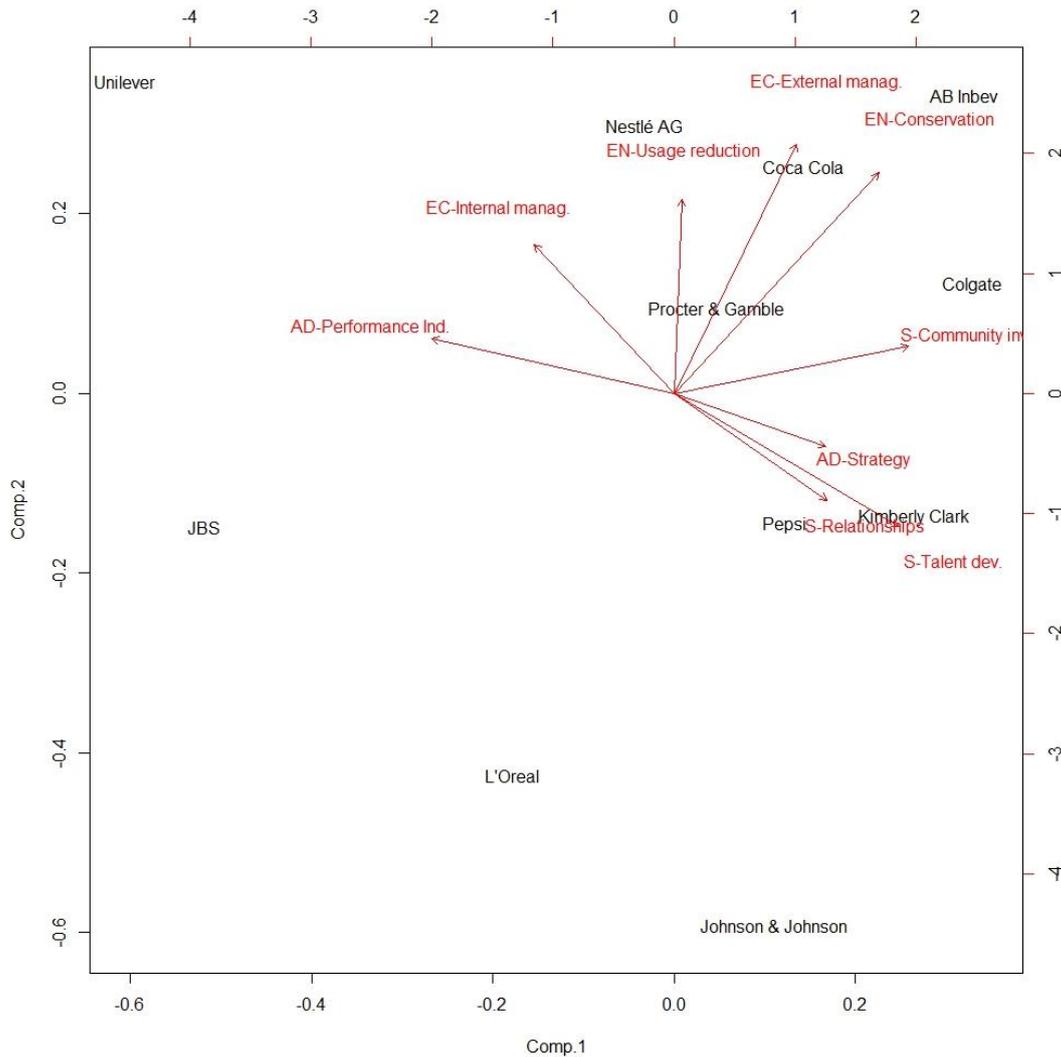


Figure 11. Biplot for the first two principal components. The biplot resulted from an analysis of the matrix of correlations between the variables derived from the content analysis of the sustainability reports through principal component analysis. The figure shows the similarity of performance between the companies on each sustainability category, the performance of each company, the similarity or correlation between sustainability categories, and the importance of each category.

The origin at which all the category vectors meet represents the average of the results for all the companies. As shown in Table 4, component 1 explains approximately 31% of the variance. Procter & Gamble is the company closest to this origin and as such presents the spread of results closest to the average of all companies, as seen in Figure 11. For principal component 1, Unilever and JBS, and AB Inbev and Kimberly Clark are the negative and positive extremes respectively. From Table 4, component 2 explains approximately 23% of the variance of the results. For component 2, the positive extremes are Unilever and AB Inbev, and the negative extreme is Johnson & Johnson. The position of the companies relative to the vectors for the sustainability categories represents their performance on each category. The results for company performance mirror those of Figure 10.

The overall importance of each category is represented by the length of its corresponding vector. Most of the categories have vectors of similar length; however, usage reduction, internal management, relationships and strategy are shown to be less important, with strategy being the least important. The similarity between the sustainability categories is also portrayed in Figure 10. The closeness of the two category vectors showcases their correlation, or lack thereof. Vectors that have similar directions and are close together are positively correlated, vectors with opposite directions are negatively correlated, and vectors with a 90 degree angle between them are not correlated. The same can be said on the relationship between variables and companies. For instance, the high score of AB Inbev on EN-Conservation (Table 3) is partially responsible for their close position in the biplot.

The environmental dimension of sustainability, comprised of the categories of usage reduction and conservation, presents little correlation to the social dimension and performance indicators. The two economic categories, internal and external management, are not strongly correlated. The two categories relevant to all dimensions of sustainability, strategy and performance indicators are strongly negatively correlated. The categories of relationships, talent development and strategy are strongly correlated positively, with community being similar to a lesser extent. In contrast, performance indicators and internal management are positively correlated to each other, but negatively correlated to the aforementioned categories. Thus, there appears to be a negative correlation between the social dimension of sustainability and the use of performance indicators. Figure 11 shows an apparent divide between companies focusing on measurable indicators of performance and management of internal operations in their reports, and those focusing on the social dimension of sustainability and CSR operations, with both camps considering the more established and sometimes mandatory environmental dimension.

5.3 Level of Disclosure of the Sustainability Reports

Results show that the reports of ten companies used the GRI standards as a basis for information disclosure (Table 6), whereas the Unilever report was not based on any international sustainability disclosure standards.

Table 6. Results from database search. This table presents data on the use of reporting and sustainability standards in the development of the sustainability reports reviewed. The level of application of the GRI standards was addressed as well as the use of external assurance and a stakeholder panel.

Company	Type	Application level/Status	CDP	UNGC	ISO	OECD	IFC	Stakeholder Panel	External assurance/Type	AA1000AS
Nestlé AG	GRI - G3.1	A+/GRI checked	yes	yes	no	yes	no	no	yes/accountant	no
Procter & Gamble	GRI - G3	Undeclared	no	no	no	no	no	no	no	no
Unilever	GRI - Referenced	Undeclared	no	no	no	no	no	no	no	no
PepsiCo	GRI - G3	B/self declared	yes	yes	no	no	no	no	no	no
Coca-Cola Company	GRI - G3.1	B+/self declared	yes	yes	no	no	yes	no	yes/accountant	no
AB Inbev	GRI - G3	B/self declared	yes	yes	no	no	no	no	no	no
JBS	GRI - G3	C/GRI checked	yes	yes	no	no	no	no	no	no
L'Oreal	GRI - G3	B+/GRI checked	yes	yes	no	yes	no	no	yes/accountant	no
Colgate Palmolive	GRI - G3	Undeclared	yes	no	no	no	no	no	no	no
kimberly clark	GRI - G3.1	A+/GRI checked	yes	yes	no	no	no	yes	yes/small consultancy	yes
Johnson & Johnson	GRI - G3	Undeclared	yes	yes	yes	no	no	no	no	no

The reports of ten companies use the GRI standards as a basis for information disclosure, whereas the Unilever report is not based on any international sustainability disclosure standards. This report however does reference the GRI guidelines for reporting, but it does not completely follow their structure. The version of the guidelines used by the reports is the third version, GRI-G3 or GRI-3.1. The fourth version of the guidelines was published after the reporting period of the selected reports finalized.

In terms of the application level of the guidelines, seven out of the eleven companies reviewed declared a GRI application level rating. Those that did not declare an application rating are Procter & Gamble, Colgate Palmolive, Johnson & Johnson and Unilever. The first three are companies that produce toiletries and household items, while Unilever also produces food and beverage goods. Four companies sought external assurance for their application rating; there were Nestlé AG, Coca Cola Company, L’Oreal and Kimberly Clark. Of these only Kimberly Clark followed the AA1000AS standards for assurance. Out of the seven companies that declare their application rating four have been checked by the GRI, while the other three are self-declared ratings.

The UNGC³ and CDP⁴ were the most relevant frameworks as they were the most referenced by the reports. The UNGC was referenced by nine companies, while the CDP was referenced by eight. Colgate Palmolive did not reference the CDP, while Procter & Gamble and Unilever referenced neither the CDP nor the UNGC. It is notable that none of these three companies declared an application rating. The OECD, ISO and IFC were not referenced by most of the companies. The OECD was referenced by two, Nestlé AG and L’Oreal, both GRI checked, and the ISO and IFC were only referenced by one company each, Johnson & Johnson and Coca Cola Company respectively.

³ The UNGC is “a strategic policy initiative for businesses that are committed to aligning their operations and strategies with ten universally accepted principles in the areas of human rights, labor, environment and anti-corruption” (UNGC, nd).

⁴ The CDP is “an international, not-for-profit organization providing the only global system for companies and cities to measure, disclose, manage and share vital environmental information” (CDP, 2014).

6 Discussion

6.1 Evolution of Research and Motivation behind Reporting

The results from the quantitative literature review carried out for RQ1 show an increase in research on sustainable supply chains and sustainability reporting, reflecting the parallel growth in awareness of the general public on the relevance of these topics. A research gap was identified on the study of sustainability reports as boundary objects. This is an open niche for researchers with a transdisciplinary perspective of issues, in which Sustainability Science can contribute to fill the gap. The implication of the results from RQ1 is that the research presented in this thesis is relevant to the field of sustainable supply chains, and it helps to extend the theoretical knowledge that is lacking in this area.

Transparency with stakeholders was identified to be a major driving force in the development of sustainability reports (Ernst & Young, BCCCC, 2013). Transparency of the information provided in the reports is necessary to achieve a high impact across the boundaries that separate stakeholders, which in turn may improve the competitive position for the company. Sustainability reports serve to differentiate the company from competitors by satisfying the requests of stakeholders regarding sustainability performance in a rigorous and standardized manner.

The value for the company resulting from the development and publication of a sustainability report was shown to be experienced in many areas. The improvements in reputation and relationships with stakeholders were the most common ways in which companies were rewarded with increased value (Ernst & Young, BCCCC, 2013). However, improvements in other aspects, like internal management, were also experienced, as a result of the knowledge generated while researching the sustainability performance of the company's operations (Kolk, 2004). It is encouraging to know that the benefits of the sustainability reporting process are already felt within companies. It is less easy to verify if and to what extent these reports are benefiting society as a whole. In this respect it is possible to speculate that, if the reports function effectively as boundary objects, pressure from stakeholders, particularly customers and NGOs will progressively foster the adoption of more sustainable practices.

This thesis deals with FMCG companies operating on a global scale and, for these large enterprises, sustainability reporting is not solely an internal activity as their extended supply chain includes other entities such as suppliers or outsourced operations. Reporting the

sustainability of the extended supply chain can be a problem if these external entities have not yet adopted the practices of sustainability reporting. In some cases, suppliers are too small or lack the resources to implement a robust reporting procedure. This occurs within the FMCG industry, in particular with food and beverage companies, who regularly use local suppliers to produce goods for regional markets. Capturing the sustainability impacts of the extended supply chain requires substantially more effort and resources for large companies than for smaller scale businesses (GRI, 2011).

6.2 Triple Bottom Line of Sustainability

All the sustainability reports reviewed considered the triple bottom line of sustainability, economic, environmental and social, but to different degrees. While the social and environmental dimensions were the best covered overall, the ratio with which dimensions were considered differed between the companies. The differences in the revealed by the content analysis indicate that supply chain sustainability is regarded differently between the companies.

Business strategy was given importance in all the reports (see Figure 10). This is not a surprising result, as an important goal of producing these reports is to show that sustainability is embedded into the supply chain strategy of the company.

The result for RQ2 showed that the social and environmental dimensions were the most considered in the sustainability reports reviewed; this finding was expected. The reason for this is that environmental and social issues relating to sustainability are historically and culturally prominent and, as such, receive more attention than those relating to the economic dimension of sustainability. In particular, companies have experienced external pressure to tackle the issues of labor rights and environmental conservation as these are more heavily regulated than others (UNGC, 2013). For companies to maintain the competitive advantage that motivates the reporting process, the gap between dimensions of sustainability must close with time. Economic performance in the context of long term sustainability must be given the same importance as environmental and social sustainability.

Economic sustainability was the least considered dimension in the reports of all the companies. The main motivation of companies for creating these reports is to improve their reputation with stakeholders, of which customers are ultimately the most important to the wellbeing of the company. Pressure from consumers is focused on the environmental impacts

and the social sustainability practices of the company (Seyfang, 2005), and thus sustainability reports consider these two dimensions to a larger extent.

The results from Figure 11 show that the two categories within economic sustainability, internal and external management, were not strongly correlated. This result is not surprising, as obtaining reliable information on internal and external management requires different gathering processes. Internal management is handled by the company alone and requires actors within the company to provide the necessary information. Information on the sustainable management of external operations requires collaboration with communities external to the company, such as suppliers or subcontractors hired for outsourcing purposes, and is thus a more difficult process than obtaining information on internal management.

The environmental dimension of supply chain sustainability was found to be consistently covered in all the reports, and as such presents little correlation with the social dimension and the categories of performance indicators and internal management. The reason for this independence is likely a result of environmental regulation within industry being more established than that for social and economic sustainability. The companies are legally required to disclose a degree of environmental sustainability information, but this is not the case with the other dimensions of sustainability. Annual financial reports are produced yearly, but this information is not typically presented in light of sustainability performance. Thus, the environmental dimension is more rigorously dealt with than other dimensions of sustainability, regardless of the rest of the content in the report.

A divide was found between the reports that include many performance indicators, which are mostly quantitative measures of performance, and reports that emphasize the social dimension of sustainability. The use of numerical performance indicators is a crucial component in supply chain management (Elrod, Murray, & Bande, 2013). However, certain sustainability practices, in particular those under the social dimension are harder to measure in this fashion. They are not easily quantified and there are not many established or recognized indicators available. As such, the companies that placed considerable more emphasis on the use of performance indicators were also those that considered the social aspects to a lesser extent than the others, focusing more of the reporting information on environmental impacts and initiatives. These companies are JBS and Unilever. The GRI guidelines for sustainability reporting have been criticized due to a perceived lack of integrated sustainability indicators. While the guidelines have many proponents, some authors argue that the performance

indicators required do not reflect the long term goal of sustainable development (Moneva, Archel, & Correa, 2006), something that is confirmed by the results of the present study.

6.3 GRI Compliance

The sustainability reports studied show that the GRI standards are the most accepted template for reporting within large multinational companies, as all but one follow the GRI guidelines. The only exception, Unilever, does not follow the template but also references the GRI standards.

The fact that much of the information in these reports is voluntarily disclosed means that their quality can be compromised. The information is not guaranteed to be representative of the operations of the company, and for these reports to be a valid source of information for the different stakeholders involved they must be externally evaluated. The reports that are externally audited to verify their adherence to the GRI standards show a stronger commitment of the companies to the reporting process. The reports that are checked for adherence by the GRI in particular present some of the highest adherence ratings and have also been audited by an external consultant, Nestlé AG (A+), L’Oreal (B+) and Kimberly Clark (A+). The JBS report is also GRI checked but has a lower rating of C. Still, the companies that allocate extra resources to improve the quality of what are largely voluntary reports show a higher level of commitment to the reporting process than those that do not.

The results in Table 6 showed that stakeholder panels have yet to be incorporated by many global companies within the FMCG sector. It is surprising that only one of the reports reviewed, the Kimberly Clark report, made use of a stakeholder panel during the reporting process. As stated in the Kimberly Clark 2012 Sustainability report, “Stakeholders from eight groups (business partners, suppliers, customers, employees, investors, socially responsible investors, NGOs and academics) were engaged through telephone interviews and, when requested, written questionnaires. To the extent possible, we have incorporated their recommendations from that engagement in this report. (KIMBERLY-CLARK, 2013)”. The results of the survey are embedded and are alluded to throughout the report of Kimberly Clark.

Assuring adherence to the standards is important to guarantee quality, but it does not guarantee that the information disclosed is representative of the needs of all relevant stakeholders. Making use of a stakeholder panel is a rigorous process that allows for the needs of stakeholders to be considered when gathering the information required to meet GRI guidelines. The fact that stakeholder panels are not widely incorporated into the development

of sustainability reports compromises their value as a boundary object. This does not necessarily mean that the needs of stakeholders haven't been met, but does imply a lack of commitment to the cause. Reports that do not reflect the needs of all stakeholders can still be useful as one way communication from the company outwards, describing their operations to stakeholders. However; non inclusiveness of stakeholders signifies failure of a report to sit between their boundaries, and as such cannot be considered an effective boundary object.

The GRI guidelines were designed based on the concept of the triple bottom line of sustainability, and they are structured around the categories that form the triple bottom line, economic, environmental and social. This does not necessarily mean that the reports follow this exact template, as many leave certain indicators out of their disclosure. GRI ratings exist for the purpose of discerning the level of application of the standards, and the reports with higher rating show a more comprehensive review of the companies' activities.

6.4 Sustainability Reports as Boundary Objects and Recommendations

Sustainability reports are here to stay (Ernst & Young, BCCCC, 2013), so it is important to expand the existing knowledge on the subject to understand their potential benefits and limitations. Framing sustainability reports as boundary objects offers a new transdisciplinary perspective on their potential to promote the sustainability of supply chains. This thesis sheds new light on their potential in aiding the transdisciplinary goal of promoting sustainable development within industry. The research contributes to sustainability science by expanding the knowledge on sustainability reports both within and beyond the boundaries of the discipline. Sustainability reports may serve as boundary objects between the company supply chain stakeholders if application of reporting standards is not superficial, and if they are developed as a collaborative effort between all relevant parties. For boundary objects to successfully bridge boundaries it is important to design them with this purpose in mind (Wenger, 2000).

As was stated previously in section 3.1, audiences do exist for sustainability reports and they are keen to engage with the company and learn from the reports as stated in the KPMG report on this issue (2008). This report identified a variety of stakeholders interested in these reports, including other businesses, individuals, investors, consultancies and public entities. The main use given to the reports by stakeholders is as a source for learning about the sustainability issues specific to the company. With interest from stakeholders in learning about the company's sustainability performance and interest from the company to improve its

reputation by providing stakeholders with transparent information, sustainability reporting has the potential to be a win-win situation for all parties involved. In practice, however, sustainability reporting in the FMCG industry remains a largely one sided effort with little stakeholder coordination.

The informal implementation of sustainability reporting standards has been criticized as a weak approach to sustainability (Moneva et al, 2006), which postulates that natural capital can be substituted by human capital (Solow, 1993). It has, furthermore, been argued that the voluntary nature of sustainability reporting allows for companies to focus on particular activities that enhance their reputation (Bebbington, Larrinaga, & Moneva, 2004). The motivation of improving the company's reputation can lead to sustainability reports being produced solely as a market qualifier, which compromises their role as a boundary objects.

Overlapping reporting timelines and a lack of resources have been singled out as the main challenges to sustainability reporting (Searcy & Buslovich, 2014). The timeline of the development of a sustainability report can easily overlap with the timelines of other reporting processes, such as annual and financial reports. This, coupled with limited staff availability and resources can compromise the effectiveness of the final report, and can lead to reporting fatigue (Searcy & Buslovich, 2014). A more focused approach to sustainability has been proposed in the form of sector specific standards, which would help identify the key indicators of sustainability particular to each specific sector (Eccles, Krzus, Rogers, & Serafeim, 2012). This could help prioritize the gathering of data that is representative of stakeholder concerns within the FMCG sector, instead of a wider set of indicators with varying relevancy to FMCG.

The GRI guidelines for sustainability reporting were found to be the accepted discourse in sustainability disclosure for FMCG companies. While application of the GRI guidelines has been shown to have positive effects on sustainable performance (Ernst & Young, Boston College Center for Corporate Citizenship, 2013), the guidelines themselves are not a panacea, which is why they are continuously renewed. Updated versions of the GRI guidelines constantly under development and the reports of Nestlé AG and Coca Cola Company state they will base their next reports on the latest version (G4).

The widespread use of indicators in sustainability reporting to describe sustainable performance, such as the ones dictated by the GRI, can be questioned regarding their credibility, as there is no definition of sustainability that is universally accepted by all involved (Holden, 2013). An important downside to the process of sustainability reporting is the

widespread sophistication in manipulating numbers and information in different ways to derive numerically credible results (Holden, 2013), results that may not be truly representative of the performance of a company. Sustainability reports have thus the potential downside of possible manipulation to improve stakeholder perception of the company's sustainability performance, without accounting for the actual performance of the company or inducing sustainable change. This concept of disseminating disinformation to present a more sustainable image is commonly referred to as 'greenwashing' (Investopedia, 2009). The possibility of the reports to serve as a method of 'greenwashing' propaganda exists in large part because they are voluntary in nature, because such regulation is not rigorous and self-declared ratings and external assurance of the reports are the only guarantees of quality. This potential downside highlights the importance of adopting external assurance as a standard practice and a guarantor of quality for the reports. It is recommended that reporting companies make use of external assurers to guarantee adherence to the GRI and other reporting standards, as it brings in an impartial party to help guarantee the quality of the information. It is also recommended that companies make use of auditors to ensure that the actual performance of the company is indeed represented in the sustainability reports. This is for the purpose of avoiding the potential downside of 'greenwashing'.

Future development of the guidelines should promote a rigorous and systematic reporting process and should ensure that sustainable development is accounted for, perhaps with the inclusion of proxy indicators for sustainable development included in guidelines. Strengthening of the economic dimension of sustainability in the GRI guidelines is recommended to better reflect the principles of sustainable development. Economic indicators must be included that do not just focus on profit maximizing, and that truly account for the full cost incurred by the products over their lifecycle (Moneva et al, 2006). It is recommended that the reports include an index that shows the location at which the different points of the GRI guidelines are covered. These indexes were included in some of the reports reviewed, but not all.

The development process of the reports was found to differ between the companies, as is reflected in the different application ratings assigned to each report. Some show a stronger commitment to the information gathering and disclosure process than others by having a higher application rating. The reports with higher ratings account for more of the points included in the GRI guidelines than those with lower scores. The companies that spent extra time and resources to assure the validity of these application ratings, whether it be external assurance or assurance by the GRI, showed a higher commitment to the reporting process.

Most companies did not actively include some of their major stakeholders in the development process, which hinders the learning potential of the parties at both sides of the boundary. The coordination between the company and stakeholders in the reporting process was found, in general, to be deficient. Coordination with stakeholders is crucial in developing a boundary object that truly blurs the lines between boundaries. The process could be improved by transferring more regulatory power on sustainability issues from governments and law enforcers to panels that include all stakeholders (UNEP et al, 2010). This would provide a stronger incentive for companies to voluntarily disclose sustainability information in a rigorous and inclusive fashion beyond the regulatory sphere, and would also encourage more negotiation between the company and its stakeholders. It is recommended that the use of the GRI guidelines for reporting is incentivized by law enforcers so as to promote a common framework will facilitate the interaction of communities with the boundary objects.

Figure 12 summarizes the implications of the findings presented in this thesis. A simple framework is proposed to aid in the development of sustainability reports that successfully blur the boundaries between stakeholders.

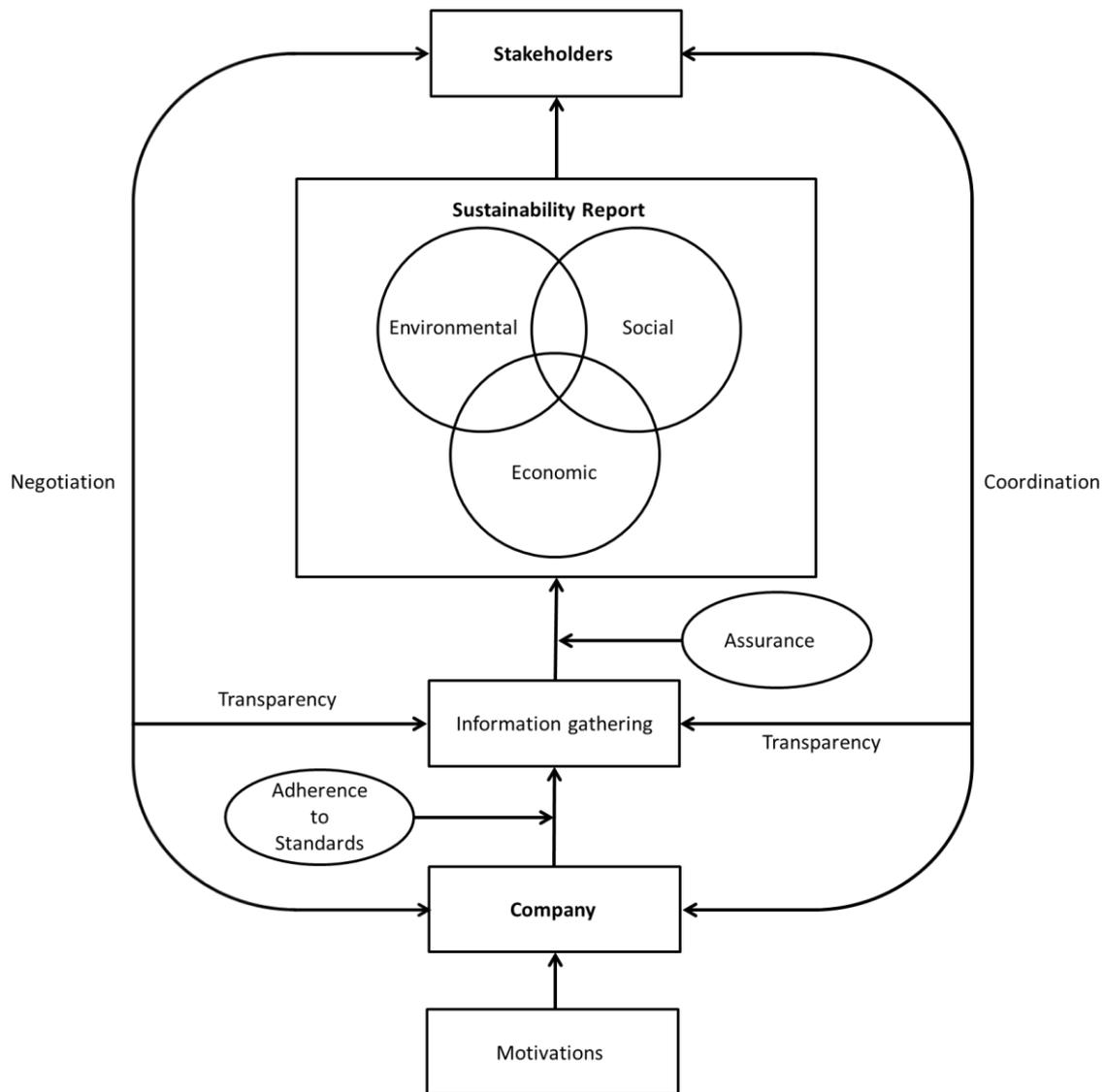


Figure 12. Framework for development of sustainability reports that act as boundary objects. This model summarizes the implications of the results presented in the study. Coordination and negotiation between the company and stakeholders are an ongoing process that helps produce transparent information on the company's sustainability performance. Adherence to standards is assessed through external assurance to ensure quality of the information.

The motivations for voluntary disclosure of sustainability performance lead the companies to set up designated teams for developing a sustainability report. These teams coordinate their operations with the needs of stakeholders, through the use of stakeholder panels, focus groups and other activities that encourage participation. This helps not only to identify the needs of supply chain stakeholders but also allows for negotiation with the company. Knowledge generated in this process can be used by the company to better align its strategy and operations with the needs of stakeholders. Coordination and negotiation are ongoing processes during the development of the reports which help produce transparent information on the company's sustainability performance. The information gathering process should address the requirements dictated by the GRI guidelines and relevant sustainability initiatives,

as well as reflect the knowledge obtained from interaction with stakeholders. The company should seek external assurance from consultancy groups and from the assurance services provided by the GRI to ensure the quality of the information presented in their sustainability report. This will result in a comprehensive and transparent sustainability report that addresses performance along the triple bottom line of sustainability to stakeholders of the supply chain. In this way, the report will provide the different stakeholders with the information they require from the company and generate mutual value.

6.5 Limitations and Further Work

There are limitations to the research presented in this thesis, many of which could be addressed in future work.

This thesis is limited by the information disclosed in the sustainability reports. It is assumed that this information is representative of the sustainable supply chain practices of the companies. However, content analysis of corporate disclosure does not directly measure sustainability performance, but measures the communication of sustainability performance. The possibility exists that the reports do not represent all the supply chain sustainability practices of the companies (Toppinen et al, 2012).

The use of methodology for RQ2 presents certain limitations. In particular, directed content analysis is limited by its use of theory as the basis for an informed approach to content analysis. Previous knowledge has the inherent limitation of a biased view of the subject area. This has the effect of the research more likely finding evidence that supports the theory on which the analysis is based on (Hsieh & Shannon, 2005).

Limitations were also experienced when carrying out the directed content analysis in terms of the different formats of the sustainability reports. The reports were all structured with very different formats, some of which do not lend themselves easily to content analysis, especially with the use of a keyword search as carried out in this study. For example, certain reports, such as those of Unilever and Procter & Gamble, make use of tabs for each of the headings under which the report is structured. This may be useful for the reader, but for a keyword search it is problematic as particular words used in the tabs yield much higher results that are not representative of their importance within the report. Excluding these extra mentions of certain keywords from the results was a time consuming effort.

One more issue that arose was counting the total words of the reports. Conversion of the PDF sustainability reports into a Rich Text Format document was necessary to carry out the word count and edit out the words not used for the content analysis; those that were repeated throughout the reports in structural tabs. The unusual format of the reports led to some of the conversions requiring extensive work to replicate the original reports before the total word count was carried out.

Further work could focus on particular geographical locations by studying regional reporting requirements as well as discrepancies in the content covered by the reports of different locations. This study did not consider a geographical dimension as the sustainability reports reviewed concerned the overall operations of global companies, and analyzing localized information would have been difficult given the scope and time frame of the study. It is worth noting that certain transnational companies produce not only a global sustainability report, but also localized reports for their largest regional divisions. A study of the different information presented in the reports published by subdivisions of the same company could yield insightful views into the internal management of the reporting process.

Further research following the template presented in this study should consider the use of interviews if possible. Interviews with industry representatives were considered but the scale of this thesis did not allow for enough time or resources to carry them out. The opinions of industry representatives have been previously used in studies of supply chain sustainability, but this method has not been applied in the same way to research on sustainability reporting within the context of sustainability science and boundary work. Including the opinions of experts could strengthen the research by comparing an internal view of the sustainability performance of the company with the results from the content analysis. Interviews with customers and other stakeholders would also benefit future studies.

7 Conclusions

The impacts of supply chain practices on sustainability are an increasing concern within both academia and industry. Sustainability reports have emerged as tools to accrue benefits for the company in the form of improved reputation and transparency with stakeholders. However, their potential as a bridge across boundaries between supply chain stakeholders has yet to be fully developed. The aim of this study was to assess the potential role of sustainability reports to act as boundary objects between the stakeholders of supply chains in the FMCG industry. The study focused on the sustainability reports of a set of global FMCG companies, assessing their content and commitment to the reporting process. The main conclusions are the following:

1. The results from the quantitative literature review suggested that knowledge of boundary objects in light of the topics of supply chains and sustainability reporting is expanding, but is still in an infancy stage. It was concluded that there is a gap in the theoretical knowledge of supply chains and sustainability reporting.
2. The directed content analysis of the sustainability reports revealed that the three dimensions of the triple bottom line of sustainability were unequally covered in the reports of the companies. Environmental and Social aspects of supply chain sustainability were described to a greater length than Economic aspects, which was found to be the weakest area of the reports.
3. The companies studied presented varying levels of commitment to the reporting process. The GRI application ratings ranged from undeclared to a high level of application, and the reports of only four companies were assured by an external party. Notably, only one company actively incorporated its stakeholders into the reporting process.
4. It was concluded that while sustainability reports have the potential to serve as a boundary object between supply chain stakeholders, the current practice within the FMCG industry does not exercise this potential.
5. The GRI guidelines would benefit from strengthening disclosure of the economic dimension of sustainability, as well as further developing indicators of social sustainability. The importance of external assurance of the sustainability reports was

highlighted, as assurance by a third party serves as a measure of the quality of the information disclosed in the reports.

6. It is recommended that stakeholders be integrated into the development process throughout its entirety by making use of stakeholder panels. Coordination of the company and its stakeholders is crucial to truly blur the boundaries between them.

The main implication of this research is that sustainability reports can be much more than a method of accounting and divulgence of information. The process of sustainability reporting can potentially serve as a bridge across the boundaries between supply chain stakeholders by actively including them in the process and tailoring the information on the company's sustainability performance to reflect their needs. For this to be achieved the reports must be designed as boundary objects from the start. A framework was created to help in the development of sustainability reports as boundary objects which emphasizes the importance of incorporating coordination, negotiation and transparency with stakeholders in the sustainability reporting process of FMCG companies.

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9 Appendices

9.1 Materials: Sustainability Reports

Table 7. Description of the FMCG companies studied. This includes their main operations and brands.

Company	Description
Nestlé AG (food and beverage)	Nestlé AG operates in the food and beverage processing industry. Products include dairy products, coffee, baby food, breakfast cereals, bottled water and snacks. Their brands include Nesspresso, Nescafé, Kit Kat and Nesquik.
Procter & Gamble (toiletries and household items)	Procter & Gamble offers products in the categories of household cleaning agents and personal care products. Their food and beverage line was discontinued in 2012. Their brands include Ariel, Gillette and Duracell.
Unilever (food and beverage, toiletries and household items)	Unilever's products include food and beverage products, household cleaners and personal care products. It is the only company of those selected to operate in both the food processing and household good industries. Their brands include Axe, Lipton, Magnum and Rexona.
PepsiCo (food and beverage)	PepsiCo operates in food and beverage production. The company owns a broad range of brands, which include Gatorade, Lay's potato chips, Mountain Dew and Pepsi, its flagship brand.
Coca-Cola Company (food and beverage)	The Coca-Cola Company produces non- alcoholic beverages. The company's brands include many different types of beverages, such as juices, energy drinks and sparkling beverages. The flagship brand is Coca-Cola.
AB Inbev (food and beverage)	Anheuser-Busch InBev is a beverage production company which focuses on the brewing and distribution of beer. Popular brands include Budweiser, Stella Artois, Corona, Brahma and Beck's.
JBS (food and beverage)	JBS is a food production company which focuses on beef, pork and chicken processing. Popular brands include Swift beef, Cedar River Farms, Packerland and Moyer.
L'Oreal (toiletries and household items)	L'Oreal is a manufacturing company focusing on cosmetic and beauty products. It is the largest cosmetics company in the world. The company's brands include Lancôme, Garnier and Vichy.
Colgate Palmolive (toiletries and household items)	Colgate Palmolive focuses on the production of household products and toiletries, such as detergents, toothpaste and toothbrushes. Popular brands include Colgate, Ajax and Hill's.
Kimberly Clark (toiletries and household items)	Kimberly Clark manufactures toiletries and personal care products, most of which are paper based. Popular brands include Scott toilet paper, Huggies, Cottonelle and flagship brand Kleenex.
Johnson & Johnson (toiletries and household items)	Johnson & Johnson's operations focus on the pharmaceuticals and personal care products. The company's brands include Band-Aid, Clean & Clear, Listerine and Tylenol.

Table 8. Information on the sustainability reports

Company	Report name	Publication year	Base country	Revenue 2012 (in \$m)
Nestlé AG	Nestlé in Society (Nestlé, 2013)	2013	Switzerland	98353
Procter & Gamble	2013 Sustainability Report (Procter & Gamble, 2013)	2013	USA	83680
Unilever	Unilever Sustainable Living Plan (Unilever, 2013)	2013	Netherlands	65998
PepsiCo	Pepsi 2011/2012 GRI Report (PepsiCo, 2013)	2013	USA	65492
Coca-Cola Company	Coca-Cola 2012/2013 GRI Report (Coca Cola Company, 2013)	2013	USA	47890
AB Inbev	2012 Gobal Citizenship Report (Anheuser-Busch InBev, 2013)	2013	Belgium	39758
JBS	Annual and Sustainability Report 2012 (JBS, 2013)	2013	Brasil	37253
L'Oreal	L'Oreal GRI Sheets (L'oreal, 2013)	2013	France	28885
Colgate Palmolive	Colgate Sustainability Report 2012 (Colgate Palmolive, 2013)	2013	USA	17085
Kimberly Clark	2012 Sustainability Report (KIMBERLY-CLARK, 2013)	2013	USA	16103
Johnson & Johnson	2012 Citizenship & Sustainability Report (Johnson & Johnson, 2013)	2013	USA	14447

9.2 Types of Supply Chains

9.2.1 *Lean*

The concept of Lean management was developed by Taichi Ohno at Toyota Motor Corporation, and is focused on waste reduction and increasing of value-added time (Ohno, 1988). Lean supply chains favor a pull system that demands products to move down the production line as required by the customer. The Toyota lean production line changed the nature of automobile manufacturing when introduced, as was documented in the book “The Machine that Changed the World” (Womack, Jones, & Roos, 1991). The waste reduction focus of Lean management has permeated to include the entire supply chain in many companies, from product design to end consumer.

Lean management has several drawbacks that affect its sustainability performance. The focus on waste reduction, while sometimes beneficial environmentally, causes the supply chain to be less responsive to external forces, and thus is less resilient than non-lean supply chains (Carvalho & Cruz-Machado, 2011). Lean management is better suited to make to order and assemble to order business strategies, those that generally have predictable demand and low product variety. A level production strategy is usually implemented to smoothen the flow of

goods through the chain. Lean does not necessarily mean green, as long distance distribution network are environmentally inefficient (Venkat & Wakeland, 2006).

9.2.2 Agile

Changing customer demands require adaptable supply systems to respond to market requirements (Carvalho & Cruz-Machado, Integrating Lean, Agile, Resilience and Green Paradigms in Supply Chain Management (LARG_SCM), 2011). As opposed to lean supply chains, where the emphasis is on waste elimination, agile supply chains focus rapid response to external changes. The schedule leveling production method favored by lean management is replaced by chase strategies. Capacity and stock buffers are in place to reduce the likelihood of stock-outs.

Baramichai et al (2007) define the agile supply chain as “An agile supply chain is an integration of business partners to enable new competencies in order to respond to rapidly changing, continually fragmenting markets. The key enablers of the agile supply chain are the dynamics of structures and relationship configuration, the end-to-end visibility of information, and the event-driven and event-based management.” (Baramichai, Zimmers Jr., & Marangos, 2007).

9.2.3 Resilient

The pressure on profit margins has led to many supply chain evolving towards the lean paradigm. This elimination of waste can lead to lower operational costs; however the lack of buffering makes the supply chain more vulnerable to external changes, in particular large scale events with little to no forecasting.

Recovering from disturbances is crucial to survival. Resilience is a necessary paradigm for long term sustainability of the supply chain. The introduction of redundancy and flexibility in a supply chain increases resilience, even if the short term sustainability impacts might appear negative. This tug of war between short term and long term goals is reflected in the current trends of supply chain management.

9.3 GRI Application Level Ratings

Report Application Level	C	C+	B	B+	A	A+	
Standard Disclosures	G3 Profile Disclosures OUTPUT	Report on: 1.1 2.1 - 2.10 3.1 - 3.8, 3.10 - 3.12 4.1 - 4.4, 4.14 - 4.15		Report on all criteria listed for Level C plus: 1.2 3.9, 3.13 4.5 - 4.13, 4.16 - 4.17		Same as requirement for Level B	
	G3 Management Approach Disclosures OUTPUT	Not Required	Report Externally Assured	Management Approach Disclosures for each Indicator Category	Report Externally Assured	Management Approach Disclosures for each Indicator Category	Report Externally Assured
	G3 Performance Indicators & Sector Supplement Performance Indicators OUTPUT	Report on a minimum of 10 Performance Indicators, including at least one from each of: Economic, Social and Environmental.		Report on a minimum of 20 Performance Indicators, at least one from each of Economic, Environmental, Human rights, Labor, Society, Product Responsibility.		Report on each core G3 and Sector Supplement* Indicator with due regard to the Materiality Principle by either: a) reporting on the Indicator or b) explaining the reason for its omission.	

*Sector supplement in final version

Figure 13. GRI application level ratings. This figure explains the disclosure criteria required to achieve the different rating level. Retrieved from www.globalreporting.org

9.4 RQ2: Keywords Used for the Directed Content Analysis

Table 9. Keywords for the content analysis

Sub-categories	Description	Keywords
AD-Performance ind.	Measurement of sustainable performance	Growth, perform, measure, indicat-, metric, achieve
AD-Strategy	Effective management and governance of processes	Monitor, trace, policy, strateg-, program, collaborat-, marketing, certifi-, standard
EC-External mgmt	Supplier management and market generation	economic, supplier management, supply, outsourc-, new market, partner
EC-Internal mgmt.	Strategic sourcing, continuous improvement and transport optimization	value, lean, continuous improvement, transport, optimiz-, sourcing
EN-Conservation	Reduction on energy reliance and environmental conservation	Conserv-, environment, energy, resource, biodiversity, water
EN-Usage red.	Waste reduction, Recycling, emission reduction, end of life management	emission, greenhouse, manufacturing, material, waste, recycl-
S-Community inv.	The company's expected employee participation within the company's broader community	Social, health, community, volunteer, charity-, social responsibility, CSR
S-Relationships	The existence of firm prescribed working conditions and codes of conduct	Relationship, ethic-, stakeholder-, business conduct, ethical conduct, supplier, customer, consumer
S-Talent dev.	Management of a sustainable workforce	educat-, train-, workforce, employee, code of conduct, safety

9.5 RQ3: Details of the Information Gathered

Table 10. Descriptions of the information gathered for RQ3. This information was retrieved from the GRI database of sustainability reports and companies, and from the sustainability reports themselves. (GRI, 2012)

Information	Description
type	Indicates whether the report is GRI based, and what version of the guidelines are used.
Application level / Status	The application rating given to the report. This rating determines indicates the extent to which the guidelines have been applied when reporting. The rating scale has 3 levels: A, B and C. A plus sign(+) is added if the report is externally assured. The status of the application level can be self-declared by the company, GRI-checked or externally assured by a third party.
CDP	Indicates explicit reference to the organization responding to one of the annual Carbon Disclosure Project (CDP) questionnaires, or participating in an associated CDP project.
UNGC	Indicates explicit reference to/ use of the United Nations Global Compact and its principles in the report.
ISO	Indicates explicit reference to/ use of the ISO 26000 clauses in the report.
OECD	Indicates explicit reference to/ use of the OECD Guidelines for Multinational Enterprises in the report.
IFC	Indicates explicit reference to/ use of the IFC Performance Standards in the report.
Stakeholder Panel/ Expert Opinion	Indicates whether there was formalized input to or feedback on the report provided by a panel of stakeholders or experts.
External assurance/Type	Indicates whether the report is externally assured by a third party.
Assurance Standard AA1000AS	Indicates application of the AccountAbility AA1000 Assurance Standard (AA1000AS) as disclosed in the external assurance statement.

9.6 RQ1: Raw Data

Table 11. Raw data for Figure 5

series 1: "supply chain"	series 2: "supply chain" + "sustainability"	Percentage of series 2 to series 1
1570	123	7.8
2780	174	6.3
8170	487	6
17800	2200	12.4
27600	6090	22.1
49800	11500	23.1
59500	17200	28.9
68500	18000	26.3

Table 12. Raw data for Figure 6

series 1: "sustainability reporting"	series 2: "sustainability reporting" + "supply chain"	series 3: motivation + "sustainability reporting"	Percentage of series 2 to series 1	Percentage of series 3 to series 1
4	0	0	0	0
12	1	6	8.3	50
58	6	21	10.3	36.2
311	58	125	18.6	40.2
1100	305	485	27.7	44.1
2120	589	998	27.8	47.1
3720	1210	1720	32.5	46.2
6460	2210	3090	34.2	47.8

Table 13. Raw data for Figure 7

series 1: "boundary objects" + "supply chain"	series 2: "sustainability report" + "boundary objects/object"
0	0
1	0
2	0
16	0
47	0
139	1
243	9
361	9