SUSTAINABLE SUPPLY CHAIN MANAGEMENT

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OBJECTIVES:

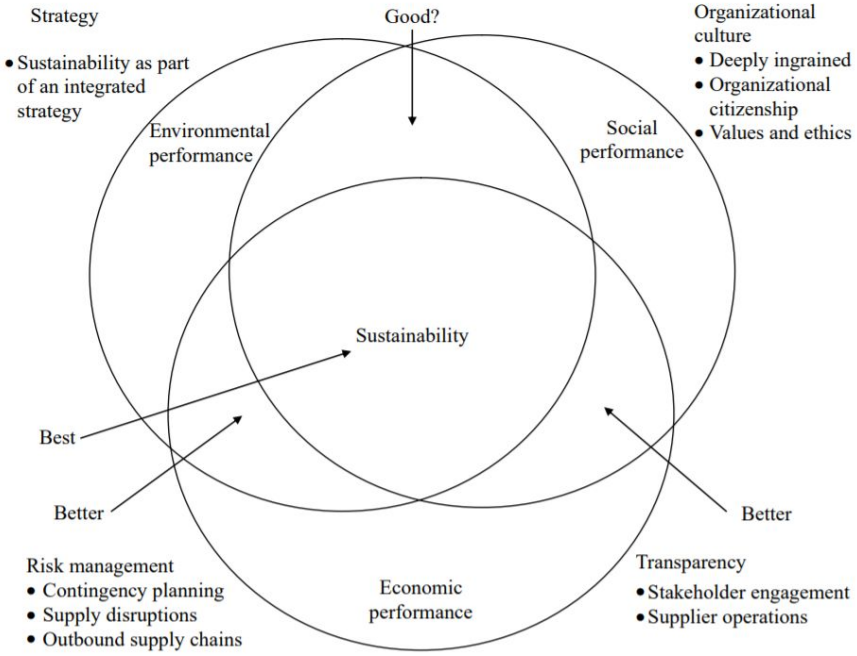
1. To holistically review sustainability in supply chain management, integrating all three dimensions of supply chain, logistics/SCM, operations/production management and social/environmental management. Owing to the lack of such integrated research in recent decades.[1]
2. To explore the supply chain risks associated with failure of incorporating sustainable practices.
3. To review the existing sustainable practices followed in the industry through case studies.

1. INTRODUCTION

The World Commission on Environment and Development (WCED, 1987 – Brundtland Commission) entitled 1987 "our common future", defined sustainability as "using resources to meet the needs of the present without compromising the ability of future generations to meet their own needs."

Supply-chain sustainability is a business issue affecting an organization's supply chain or **logistics network** in terms of environmental, risk, and waste costs. There is a growing need for integrating environmentally sound choices into supply-chain management. Sustainability in the supply chain is increasingly seen among high-level executives as essential to deliver profitability and has replaced monetary cost, value, and speed as the dominant topic of discussion among purchasing and supply professionals. A sustainable supply chain seizes value creation opportunities and offers significant competitive advantages for early adopters and process innovators.

[1] Winter, Knemeyer (2012)(16)
[2] Fig(1): Carter and Rogers (2008)(15)



Carter and Rogers(2008)(15) form a conceptualized theory approach to formulate a framework of sustainability applied to the supply chain known as SSCM. This concept involves evaluation of the triple bottom line parameters from Elkington(1998)- economic performance, social performance and environmental performance. Carter and Rogers state that rather than the focus on immediate improvement in economic performance, a company should engage in all three aspects of the SSCM to aim for long term economic growth. "What is it that we need to do, not just to survive, but to thrive, and not just one year, three years, or five years from now, but in ten years, 20 years, and beyond?"

Carter and Rogers(2008) identify four major facilitators of SSCM as shown in figure, namely,

1. Strategy: incorporating sustainability as an objective in the long term strategy
2. Organizational culture: Aligning the goals of the entire organization towards long term achievement of sustainability. Respect for society within and outside of the organization and the natural environment.
3. Risk management: Contingency planning for upstream and downstream chain
4. Transparency and communication with stakeholders and visibility and traceability in upstream and downstream operations.

1.1 BACKGROUND

Supply chains are critical links that connect an organization's inputs to its outputs. Traditional challenges have included lowering costs, ensuring just-in-time delivery, and shrinking transportation times to allow better reaction to business challenges. However, the increasing environmental costs of these networks and growing consumer pressure for eco-friendly products has led many organizations to look at supply chain

sustainability as a new measure of profitable logistics management. This shift is reflected by an understanding that sustainable supply chains frequently mean profitable supply chains.
Many companies are limited to measuring the sustainability of their own business operations and are unable to extend this evaluation to their suppliers and customers. This makes determining their true environmental costs highly challenging and reduces their ability to remove waste from the supply chains. However much progress has been made in defining supply chain sustainability and benchmarking tools are now available that enable sustainability action plans to be developed and implemented.

1.2 PUTTING SUSTAINABILITY IN SUPPLY CHAIN

Three Tiers of Sustainability

In 2008, The Future Laboratory produced a ranking system for the different levels of sustainability being achieved by organization. This was called the **Three Tiers of Sustainability**:

Tier 1: Getting the basics right

This is the base level and is the stage in which the majority of organizations are at. Companies employ simple measures such as switching lights and PCs off when left idle, recycling paper, and using greener forms of travel with the purpose of reducing the day-to-day carbon footprint. Some companies also employ self-service technologies such as centralized procurement and teleconferencing.

Tier 2: Learning to think sustainably

This is the second level, where companies begin to realize the need to embed sustainability into supply chain operations. Companies tend to achieve this level when they assess their impact across a local range of operations. In terms of the supply chain, this could involve supplier management, product design, manufacturing rationalization, and distribution optimization.

Tier 3: The science of sustainability

The third tier of supply chain sustainability uses auditing and benchmarks to provide a framework for governing sustainable supply chain operations. This gives clarity around the environmental impact of adjustments to supply chain agility, flexibility, and cost in the supply chain network.Moving towards this level means being driven by the current climate (in which companies recognize cost savings through green operations as being significant) as well as pushing emerging regulations and standards at both an industry and governmental level.

1.3 SSCM CATEGORIES AND PRACTICES

SCM is now an established field of research and practice. SCM originates in part from the idea of minimizing waste because waste reduces economic profitability. These early links to environmental management were fueled by the desire to optimize economic performance, indicating the introduction of the environmental aspect even in the infant stages of SCM . The ideas grew into green SCM and

culminated in SSCM. A comprehensive literature review on SSCM by Seuring and Müller yielded 191 papers in English, peer-reviewed journals between the years 1997 and 2007, showing a steady rise in the number of publications for the later years. This number has risen to 300 in the year 2011 , showing that SSCM is currently a thriving field of academic research.

We avoid repeating definitions of SCM that can be found in a number of contributions already. In SSCM literature, the inclusion of sustainability into the theory of SCM is most often based on the triple bottom line (TBL) approach which calls for equal consideration of all three pillars of sustainability, namely, economy, ecology and society. Seuring and Müller define SSCM as: the management of material, information and capital flows as well as cooperation among companies along the supply chain while taking goals from all three dimensions of sustainable development, i.e. economic, environmental and social, into account which are derived from customer and stakeholder requirements.

In our framework (Figure 1), we grouped the practices into five general categories. They are identified throughout the literature on SSCM. We will argue about the completeness ofthe framework and the discrimination among the single elements after first introducing them. These categories are orientation, continuity, collaboration, risk management and proactivity. With these categories, (S)SCM can be structured on three hierarchical levels and respective intentions and goals as shown in Figure 1. When breaking down the single categories, we will also introduce respective practices. The practices are the operational implementation of the goals of each category. Furthermore, some differences between conventional SCM and SSCM will be highlighted in the subsequent description.However, when presenting such a framework, the question arises, how complete and comprehensive it can and has to be and how to justify it. We see the framework as an effort in theorizing based on disciplined imagination and reflexivity. The single elements in the framework are discriminant to each other as will be further explained in the following paragraphs. Yet, considering all elements, we also regard the framework comprehensive as a whole because core aspects of SSCM are Explained.

Figure 1 Sustainable supply chain management categories and practices

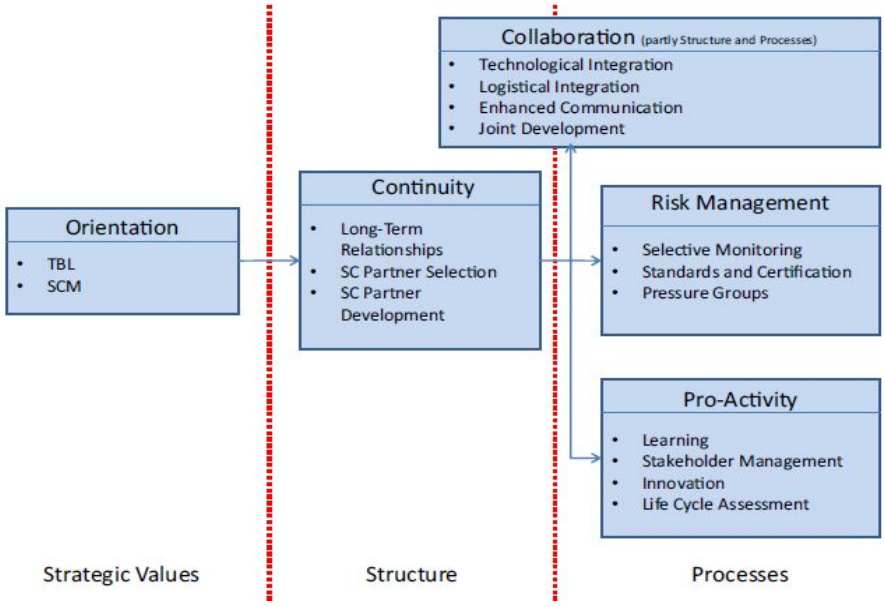


image- Putting sustainability into supply chain management, Philip Beske Stefan Seuring

1.4 ORIENTATION

The foundation of a sustainable management of the supply chain is the mindset of a company. A dedication to sustainability and to SCM has to be incorporated on a strategic level and in the values of the company. This "orientation" emphasizes top-management support as a key factor for reaching the full potential of SSCM. Being part of the strategic values of a company, orientation also implies to integrate sustainability in the organization's strategy and strategy formulation for reaching a competitive advantage.Orientation is located on the strategic
values level of a supply chain

1.5 CONTINUITY

The category Continuity is placed on a second stage (see Figure 1), where the structure of the supply chain is set up, i.e. the way the different partners work together. One of the key factors in SSCM is good and mutual beneficial relationships. Such continuity considers the overall supply chain performance and not only the performance of each supply chain member while mutually sharing risks and profits. All of the practices mentioned are relevant for both SSCM and SCM

1.6 COLLABORATION

Collaboration is situated at both the structural and operational levels of the framework. On the one hand, this category encompasses issues that allow and encourage collaboration in the first place, i.e. having an organizational structure or the IT infrastructure to enable collaboration. On the other hand, aspects of how collaboration is actually achieved in the SC are grouped on the operational level, i.e. regular interdepartmental and interorganizational meetings. This third category summarizes practices that are geared toward actually achieving the sustainability outcomes of a supply chain. Already in supply chain management, collaboration plays an important role in enhancing the competitive advantage of a supply network and can significantly reduce overall cost and uncertainty. Vachon and Klassen state that the "value of collaboration in the supply chain comes from the possibility of inter-organizational learning". As such, collaboration can be understood as one step further than cooperation. Collaboration is often long-term oriented. Collaboration is viewed as a key to achieving sustainability performance. Examples include joint product development and design or the direct involvement of a company with its suppliers and customers in planning and forecasting , which Vachon and Klassen ha(2008) labeled as "Logistics Integration". Especially for green and sustainable products, knowledge about components, ingredients and working conditions at all stages of the SC is essential because the detailed information lies usually with the respective supplier.

Risk management

It is a common belief that companies engaging in the field of sustainability and implementing SSCM practices are prone to different and sometimes even higher risks than conventional SCM . These risks include the likelihood of SC disruption due to a smaller supplier base or the risk of loss of reputation when shortcomings are made public by nongovernmental organizations (NGOs) . At the same time, environmental and social risk reduction is a relevant driver for companies to engage in respective practices

at all. The most common risk reduction mechanism is the adoption of standards and requiring the same from suppliers, sometimes even customers. At the same time, supplier base reduction and increased cooperation are means to reduce the complexity and uncertainty of an SC which ultimately leads to risk reduction. By engaging in long-term relationships, companies can reduce the supplier base and hence the risks associated with individual suppliers, though at the cost of higher dependability on fewer suppliers. To reduce risks and uncertainty, transparency and thus enhanced communication is again a useful practice, especially when evaluating whether ingredients and working conditions are acceptable. Furthermore, informal supplier assessment, for which enhanced information sharing is a prerogative, is a common tool in environmental management systems. Relatively simple ways to solve risk-related issues are "Standards and Certification". Standards are a relatively easy way to make the supply chain more environmentally friendly and socially responsible and are, therefore, often used both in SSCM and SCM.

Proactivity

Companies engaging in sustainability practices are considered to be proactive. Because they often walk a new path, new technologies and methodologies need to be developed. Hence, they use tools to foster "Innovation" in their supply chain. In the sense of SSCM, innovation has a double meaning. First, companies that choose to embrace sustainability strategies invest in the development of sustainable products and services. In the most advanced stages, such products are already proactively envisioned with the possibility of recycling and reusing and include a "Life Cycle Assessment". This informs product design and, in some cases, supplier selection thereby reducing environmental burden. Other attempts at measuring sustainability performance along the supply chain are currently implemented, e.g. calculating and reducing the carbon footprint of products along the supply chain is one way to enhance one dimension of sustainability.

Comparing sustainable and "conventional" SCM

It is an accepted fact that SSCM is a theoretical and practical broadening of SCM. As such, SSCM is in a way a "SCM Plus", with the added sustainability criteria. The practices used to seek such sustainability are, if not unique, at least more prominent in SSCM. Table I offers an overview of the five different categories and related practices. In the two left columns, several examples from the literature on both SSCM and SCM are given. Hence, it can be put forward that the practices "Dedication to the Triple Bottom Line", "Stakeholder Management" and "Life Cycle Assessment" are exclusively found in SSCM. In the case of "Standards and Certification", both SSCM and SCM use them, but a specific set of standards and certificates geared toward ensuring sustainability goals is developed and applied for SSCM. Therefore, we argue for a partial exclusivity in this category as well. Furthermore, "Enhanced Communication", "Technological Integration" and "SC Partner Selection" have to be aligned with a strategy for sustainability so that they would actually contribute to sustainability performance. Although as shown in the definition of SCM in chapter 2, high relationship quality and transparency through information flows are important for good SC performance, irrespective of a focus on sustainability, therefore related practices are found in SCM as well. We admit that the evidence given in Table I is limited and anecdotal at best. For clarification purposes, we numbered the practices to indicate which of the exemplary references given provide support for the corresponding practice.

2. LITERATURE REVIEW :

Research opportunities in sustainable supply chain management :

- Reviews of certain lines of development regarding the intersection of sustainability and supply chain management.
- Empirical or case studies of companies and other supply chain actors' initiatives that aim to enhance sustainability aspects that may be integrated into supply chain management.
- Concepts and cases on the integration of particularly rele-vant sustainability issues into supply chain management.These topics might cover environmental and/or social issues only
- Contributions on the relation between the three dimensions of sustainability (i.e. economic, environmental,social) in a supply chain perspective, so that the under-standing of winwin and trade-off situations is advanced.
- Case studies on how actors improve the sustainability performance of products and services by collaboration in the supply chain
- The need or limits for supply chain integration for providing environmentally and socially sound products.
- The influence of cultural and ethical aspects in the context of sustainability and supply chain management.
- Corporate Social Responsibility and supply chain management.
- The use of environmental and social standards in the supply chain, in particular for supplier evaluation.
- The interrelation of sustainable supply chain management with other concepts of inter-organizational sustainability management.

What you will see in the upcoming special issue is a broad variety of research directions, methodologies and insights based on research from all over the world. We intentionally did not limit the methodological perspectives and include conceptual, analytical, and practical papers in the mix. We hope that these papers provide a more complete picture of the state-of-the-art of research in this continually growing disciplinary field.
An overview of the special issue contributions :

1.Linking supply chain strength to sustainable development: A country-level analysis

- In the paper ''Linking supply chain strength to sustainable development: A country-level analysis''[3] , Vachon and Mao investigate the potential link between supply chain characteristics and sustainable development at the country level.
- In particular, the linkage between

supply chain strength, generally defined as the number and quality of the suppliers and customers in a country, and three dimensions of sustainable development namely environmental
performance, corporate environmental practices, and social sustainability is assessed.

2.Influences, practices and opportunities for environmental supply chain management in Nova Scotia SMEs

[3] Linking supply chain strength to sustainable development: A country-level analysis - By Vachon & Mao

- The author team of Coˆte´, Lopez, Marche, Perron and Wright study ‘‘Influences, practices and opportunities for environmental supply chain management in Nova Scotia SMEs’’.
- Their starting point is that supply chain management offers considerable opportunities to reduce a company’s environmental impact.
- The supply chains of three small and medium enterprises (SMEs) operating in the Burnside Industrial Park in Nova Scotia, Canada are investigated to explore the opportunities to improve environmental performance of SMEs linked in supply chains.
- This study has confirmed that time and, to a lesser degree, financial resources to address solid waste and energy issues are the greatest limiting factors. This study demonstrates that opportunities do exist to reduce greenhouse gas emissions and solid waste.
- Although the benefits that would be gained from the implementation of any of the individual actions in the supply chains explored in this study are individually small.

3. Investigating corporate social responsibility in supply chains e A SME perspective

- The paper ‘‘Investigating corporate social responsibility in supply chains - A SME perspective’’ [4] analyzes the practices adopted and difficulties experienced by small and medium-sized enterprises to transfer socially responsible behaviours to suppliers that operate in developing countries.
- They conducted a multiple case study on five Italian socially responsible small and medium-sized enterprises. An important finding in their research was that consumer behaviour is not a corporate social responsibility (CSR) driver; the companies decided to engage in CSR due to the personal values of the owner.
- The companies in their study use a management strategy towards suppliers that combines compliance requirements and capacity building approaches.
- The findings have shown that these organizations invest significant resources in communicating CSR to suppliers, and in monitoring and auditing their suppliers.

4. A supply chain management approach for investigating the role of tour operators on sustainable tourism: The case of TUI

- The insights into a service management related supply chain, an issue that has not received much attention in the literature on sustainable supply chain.
- As the title emphasizes ‘‘A supply chain management approach for investigating the role of tour operators on sustainable tourism: The case of TUI’’[5], one particular group of actors in a service industry is addressed.
- This research is justified because of the impact that tour operators as focal companies have on the design of the overall service.

[4] Investigating corporate social responsibility in supply chains - A SME perspective - By Ciliberti Pontrandolfo & Scozzi(14)

[5] A supply chain management approach for investigating the role of tour operators on sustainable tourism: The case of TUI - Sigala, ETH Zurich, Switzerland(13)

- In choosing a single case study approach, the author provides in-depth insights into the measure taken to apply supply chain management thought in a tourism environment. TUI uses tourism demand forces and pressures for motivating suppliers to adopt sustainable practices.
- Their goal is achieved by publishing good sustainable performance internally and externally, e.g. in travel agents' catalogues, brochures, websites, and related publications, where rankings of suppliers are provided.

5. A recursive ecological indicator system for the supply chain of a company

- The aim to develop appropriate performance indicators, Schmidt and Schwegler build on life-cycle assessment thought in their paper ''A recursive ecological indicator system for the supply chain of a company''[6].
- They propose the concept of cumulative eco-intensity with which environmental or sustainability indicators are related to the added value of economic activities.
- Eco-intensities are thereby defined as the ratio between ecological expenditure and economic benefit or the inverse of eco-efficiency.
- Hence, emphasis is placed on developing one aggregate indicator.
- The authors point out that such an approach at comparatively low expenditure for the individual companies allows vertical comparisons along the value-adding chain and horizontal comparisons among companies or production locations The link to the supply chain is established as related environmental burdens are passes on with the material flows in the supply chain.
- Such top-level indicators can be used to guide general decision making, but would have to be complemented with more specific ones.

3. RISK MANAGEMENT APPROACH

Sustainability can be considered as the degree to which present decisions of organisations impact on the future situation of the natural environment, societies and business viability. In a perspective slightly broader than the Brundtland definition, sustainability is a framework for assessing the impact of present decisions on the situation of future individuals. Any definition of sustainability that is covered by this perspective has to consider the future consequences of present actions. We cannot predict the future consequences of present decisions with certainty. All we can do is to assess the risks that present decisions impose on future individuals. So sustainability needs to be stated in terms of risks rather than in terms of certitudes. Neglecting uncertainty is problematic, because it allocates all risk-related costs to future generations, which contradicts the main tenet of sustainable development (10)(Krysiak, 2009).
A representative classification of supply chain risks separates them into two major categories: endogenous risks that are caused by companies' activities along their supply chains and exogenous risks that are brought about to companies by their interaction with external environment that they operate. (11)(Faisal,2009)

[6] Schmidt & Schwegler - A recursive ecological indicator system for the supply chain of a company

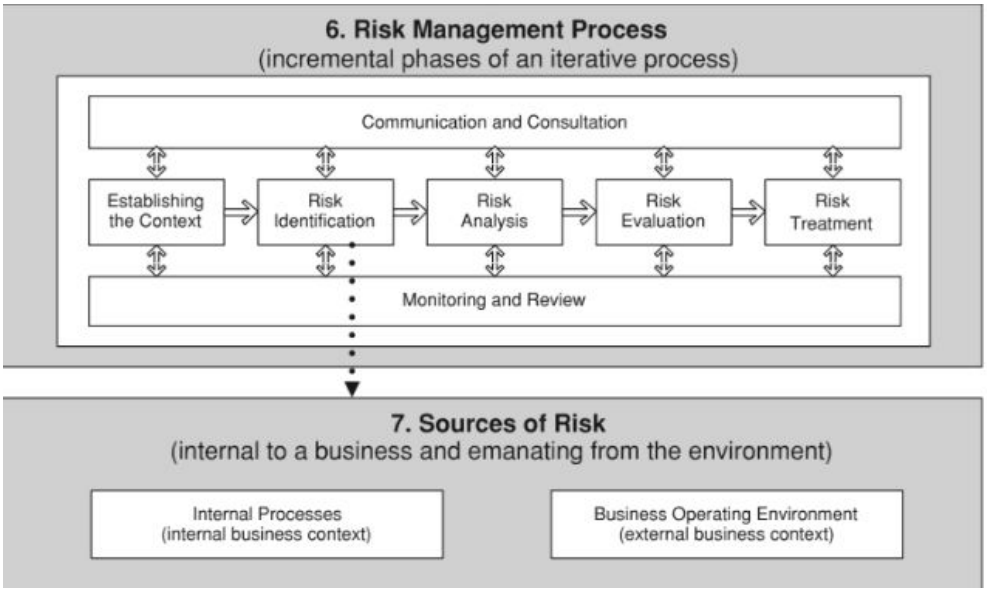


Fig 2 :Steps of risk management, (9)Chapman, R.J., 2009.

RISK IDENTIFICATION:

This is the first step where all possible supply chain sustainability-related risks are identified with tools such as risk checklists, taxonomies and risk mapping

RISK ASSESSMENT:

All the identified risks are assessed – typically in terms of their likelihood of occurrence and the impact that they may have on supply chain performance. Usual methods used are either intuitive (e.g. brainstorming), inductive (e.g. checklists, preliminary hazard analysis, event and fault tree analyses and FMEA), or deductive (e.g. accident investigation, controlled experiments)

RISK ANALYSIS:

Following their assessment, the risks are prioritised in terms of their relative importance. Pareto analysis, or more complex techniques such as fuzzy AHP are typically used. Their potential causes and consequences are then explored. Root cause and sensitivity analysis, cause and effect analysis, or controlled experiments can be used to identify their drivers and pathways. Only if a company understands the root causes and potential effects of a risk, it can then decide on the most appropriate response.

RISK TREATMENT:

Four major responses are suggested in the literature to treat supply chain risks. These responses are linked to sustainability-related risks:

Avoid: It involves the avoidance of an activity that may lead to exposure to a risk – e.g. drop, or not select suppliers that use unsustainable technologies or processes.

Control: It involves any attempt to prevent risks through reduction of the probability of a risk event occurring – e.g., establish a supplier development programme to reduce the probability of environmental accidents. It may also involve actions to mitigate the consequences (severity) of a sustainability-related risk, or to reduce the probability of a potential consequence to take place – e.g. respond swiftly to negative reports about unsustainable practices by a supplier.

Share: It involves cooperation with suppliers to achieve risk pooling – e.g. multilateral supply chain agreements about the level of carbon footprint across the entire supply chain. This response involves partial

transfer (avoidance) of the risk to the supply chain. This option may also include transferring the risk by using insurance against the likelihood that it will surface

Retain: It involves the acceptance of the potential damage that will be incurred by a sustainability-related risk event, in cases where the actual cost of the other strategies would be higher than the total cost of the potential damage.

Risk monitoring: The final stage involves continuously monitoring the effects of the response strategy to a particular risk, identifying any changes due to the dynamic nature of supply chains or some changes in regulations or operating policies, and then proposing new solutions. [7]

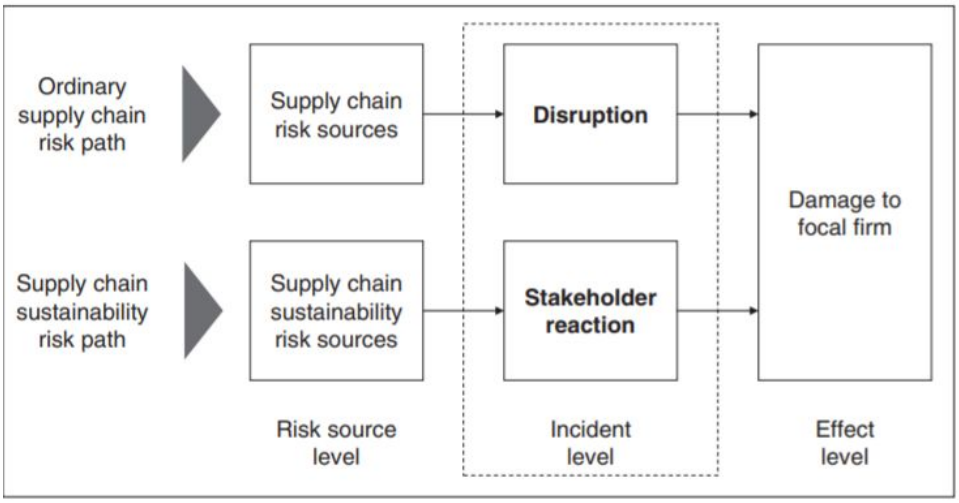


Fig (3)[8] Trigger incident for stakeholder function

In the figure above, Hoffman et al., 2014 (8), describes a concept which explains the stakeholder function which ultimately affects a firm's performance. The identified stakeholders by Hoffman et al., 2014 detect the sustainability risks a firm is facing. These stakeholders expect firms to adhere to norms and regulations (the government) or to provide products that are based on socially fair and ecologically friendly supply chain operations (customers). Investors expect the firm to be compliant with social, ecological and ethical issues as each may affect the financial bottom line. Conversely, (labour) unions focus solely on social aspects, such as adequate compensation, job protection and safety standards. In contrast, a minority of stakeholders have negative expectations. This category entails stakeholders who expect the firm to fail in social, ecological or ethical issues. This may hold true for competitors who would obtain a competitive advantage.

3.2 RISK ANALYSIS CASE STUDY[9]

A large survey of a random sample of 600 certified senior supply chain professionals listed with the national purchasing and supply organisations in France and the UK was selected, from different industrial sectors. The exploration of potential causes and effects of sustainability related risks, involved face-to-face semi-structured interviews with managers of two textile companies in the UK and France. The interviews lasted 1 h on average. Through a brief interview managers were asked to identify whether these risks are evident or not in their companies' supply chains.

The FMEA technique has been applied for the risk assessment and analysis steps. The FMEA has been applied as follows: the survey participants were asked to evaluate the level of severity (S), probability of occurrence (P) and ease of detection (D) of each risk factor. Multiplication of these components enables

[7] (7)M. Giannakis, T. Papadopoulos(2016)
[8] (8)Hoffman et al., 2014)
[9] (7)M. Giannakis, T. Papadopoulos(2016)

the prioritisation of risk factors based on risk priority numbers (RPNi¼Si *Pi *Di , where i¼ risk factor). The higher the RPN, the greater the risk of that event. After the calculation of RPNs, the major risks were calculated through a Pareto diagram. Once the major risk factors have been identified and assessed and potential causes and effects were identified, correlation analyses were conducted, using data from the survey, to identify potential correlations amongst the most important risk factors. Potential causality between the hypothesised correlations was not investigated.

Findings:

1. A comparison between the three major thematic groups indicates that, social-related risks are perceived as "slightly lesser risks" compared to economic, or environmental. Although environmental (exogenous) and social related issues have higher media exposure, the survey results show that the perceived priority numbers of economic and environmental (endogenous) risks are higher.
2. Endogenous risks are perceived as being more "important" than exogenous. This is because endogenous risks originate primarily from the actions (or lack of action) of a company or its suppliers, which have the direct responsibility for their control/mitigation.
3. Concerns about environmental risks such as greenhouse gases, pollution, non-compliance with sustainability laws and natural disasters dominate the list of the most eminent perceived risks, reflecting both how environmental issues impact economic activity, as well as how little noticeable action has been taken to address them.
4. Among the economic risks, bribery allegations/corruption are perceived as close to equally impactful as financial crises, reflecting both an economic as well as a social phenomenon; the rising awareness of the social responsibility of businesses in light of the increasing socio-economic equality that is experienced in developed as well as developing economies.
5. Child labour is ranked as the most pressing social risk, primarily due to its severity and difficulty in detecting it, rather than its frequency of occurrence. This reflects the difficulty in managing global supply chain in a sustainable manner and indirectly points to the need for greater transparency and traceability of supply chain processes.
6. The top 8 sustainability-related risk factors revealed by the survey are natural disasters, greenhouse gas emissions child/ forced labour, financial crisis, bribery allegations, pollution, noncompliance with sustainability laws and energy consumption.
7. Risk factors such as heatwaves and droughts, unfair wages, social instability, water scarcity are ranked low, since they are not perceived to be sensitive issues for the companies operating in the Northern Europe region.
8. The results show that risk prevention and mitigation control strategies are the most likely to be used for sustainability-related risks. Holding safety stock, having quality management systems, due diligence, responsible contracting, purchasing and verification processes, are some common control responses. Risk reduction strategies are also commonly used to reduce the likelihood and/or severity of risk event. Complying with regulations and standards, having contingency plans and training programs for employees are some common reduction strategies.
9. However, cooperation is not likely to be used . This raises some important insights about the lack of supply collaboration.

Conclusion and inference:

Based on the findings from the case studies, a company's strategic direction to "endogenous" environmental and social risks should be to internalise them and to attempt to find strategies to mitigate them through reduction, control and sharing processes, rather than to avoid, or transfer them to the extended environment.

The chief operating officer of the UK-based textile company explained during his interview: “Our priority is to increase as much as possible the transparency across our supply chains, to be able to identify and eliminate any potentially damaging practices of ourselves or our suppliers to the environment. If we end up paying for the damage we create, this would eradicate our profit” . The CEO of the French textile company described: “we have to be ready, many things can happen that could disrupt our business. We have contingency plans for our projects (especially in vulnerable regions), we have a supplier auditing programme, but increasingly we have also started insuring against extreme climatic events.”
Major exogenous sustainability-related risks were also found to be correlated to endogenous risks, which leads to the conclusion that through a holistic and systematic risk management process sustainability-related risks could be contained.

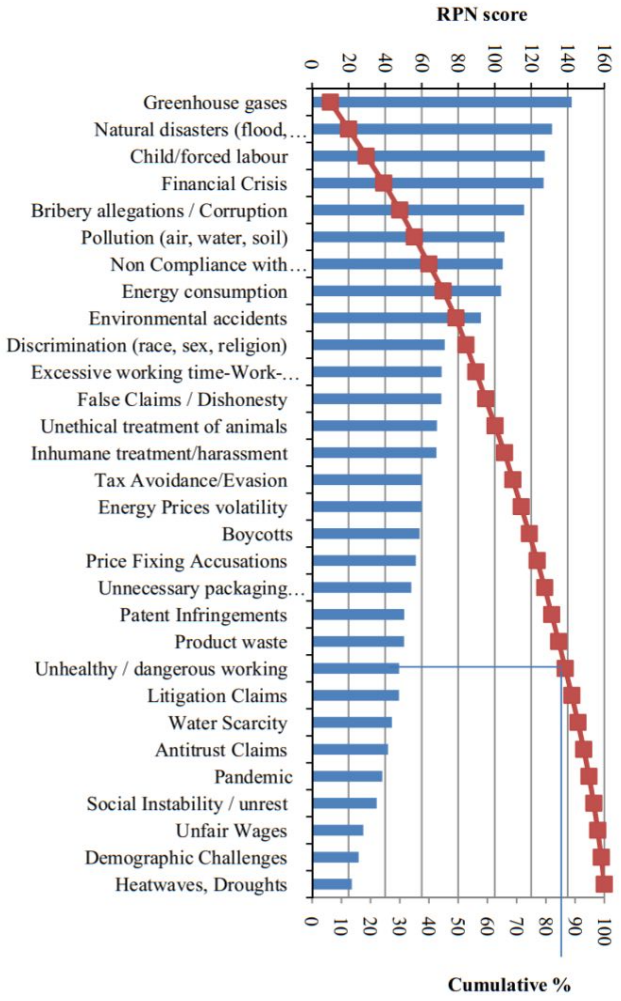


Fig 5: Pareto Analysis of risk factors in the case study by M. Giannakis, T. Papadopoulos(2016)

4. CASE STUDY: IKEA

WHY IKEA?

IKEA was chosen for the case study, amongst many, for three primary reasons.
1)IKEA is a global firm with manufacturing and distribution centres across the world;
2)Its supply chain is vast and complex.
3) IKEA is a pioneer firm that introduced a systematic way of working with sustainability across its operations (Al€ange, Clancy, & Marmgren, 2016).
Also, IKEA aligns with the goals of our study: to analyse a global firm that successfully develops and implements real and impactful sustainability efforts within their organisation and across their supply chain.

At IKEA, Inbound and Operations & Production Logistics are interconnected in IWAY Standards.
IWAY is the 'IKEA way' of purchasing products, materials and services and is the IKEA Supplier Code of Conduct (IKEA Supply AG, 2008). It establishes the minimum requirements for environmental, social, and working conditions when purchasing products, materials and services.
IKEA believes good business can be done while being a good business; this is a pre-condition of future growth alongside suppliers that share the same vision. The guiding principles of IWAY are based on what is best for the child, worker, and the environment.
IWAY standards include statements of legal compliances, confidentiality, and business ethics. Firstly, legal compliances require that IKEA suppliers adhere to and comply with relevant applicable national laws or IKEA WAY specific requirements. Secondly, confidentiality is the importance placed on the trust and relationship between IKEA and its suppliers and the assurance that IKEA treats such relationships as confidential. Lastly, business ethics pertains to the foundation of IWAY which is based on trust, integrity, and honesty, as key to successfully implementing sustainability.

The specific components of IWAY Standards include fourteen general sections:
1. Start-up requirements. More importantly known as 'IWAY Must', establishes primary compliances for all suppliers before IKEA signs a business contract. It includes the implementation of all measures to prevent child labour and considers the best interests of the child. It also includes forced and bonded labour where IKEA suppliers shall not use forced, prison, bonded, or involuntary labour. The IWAY Must incorporates the prevention of severe environmental pollution that widely spreads and where its effects are difficult or expensive to correct. IKEA supplier are required to prevent workers from exposure to severe safety hazards, are required to maintain transparent and reliable records on employee working hours and wages, as well as provide accidental insurance to all workers for coverage of medical treatment due to work-related accidents.
2. General conditions. This includes a supplier commitment to comply with the IWAY requirements and to appoint one, or several persons, the responsibility and authority to ensure IWAY compliance. IWAY also include communication to sub-suppliers and employees; IKEA suppliers are required to communicate the IWAY to its workers and to its suppliers who are involved in IKEA. IKEA suppliers are required to

perform internal IWAY audits minimum every 12 months, as well as establish internal procedures to guarantee regular updates of the IWAY requirements.

3. Environmental. This compliance involves environmental protection including classification, reporting and inspections by authorities as well as compliance with local laws relating pollution such as air, noise, ground, and water pollution. It also includes energy measuring and recording as well as setting targets for its reduction.

4. Chemicals. IKEA suppliers are required to comply with local laws related to chemicals as well as maintaining lists, establish proper procedures, provide employee training, as well as ensure proper labelling, storage, handling, and transportation of chemicals.

5. Hazardous and non-hazardous waste. This includes legal compliance with local laws and regulations, establish and keep adequate records of waste, have established procedure for the handling, storing, transportation, and disposal of waste, provide employee training, as well as have proper licenced contractors for proper disposal and follow legal requirements for on-site incineration and landfill.

6. Fire prevention. This involves adhering to local laws regarding fire protection including fire classification, reporting, and inspection by authorities. It also requires that all suppliers keep appropriate fire report incident records, provide appropriate firefighting equipment and training, have appropriate and functional emergency exits and fire alarms, as well as conduct evacuation drills annually.

7. Worker health and safety. This ensures that IKEA suppliers comply with applicable laws in classification, workplace risk analysis, reporting and inspections by authorities. This includes a broad list of issues such as incident report records, health and safety training, having necessary machine safety devices, provide safety instructions, ensure safety hazards are avoided, as well as provide personal protective and first aid equipment. Additionally, suppliers are required to maintain adequate internal air quality, appropriate temperature and noise levels, have appropriate lighting, provide drinking water and hygiene facilities, but most importantly IKEA suppliers shall have an active Health & Safety Committee.

8. Housing facilities. This requires that IKEA suppliers ensure provision of clean, private, quiet, safe, hygienic, and reasonable living space.

9. Wages, benefits and working hours. This ensures that their suppliers comply with laws and regulations and provide written information to workers prior to employment about wages and employment terms. Requirements include adequate payroll and attendance records, adhere to established working hours and overtime, pay wages and overtime, as well as provide breaks, days off, leave, and benefits.

10. Prevention of child labour. As previously stated, IKEA suppliers are required to implement all measures to prevent child labour to consider the best interests of the child. They are required to abide the UN Convention on the Rights of the Child as well as national and international laws; this is applicable to IKEA's first tier supplier as well as their sub-contractors.

11. Forced & bonded labour. As mentioned, forced, prisoned, bonded, or involuntary labour are not permitted for IKEA's suppliers and their sub-contractors.

12. Discrimination. Additionally, IKEA suppliers will not discriminate because of race, religion beliefs, gender, marital or maternal status, age political affiliation, national origin, disability, sexual orientation or any other basis.

13. Freedom of association. Suppliers do not prevent workers from associating freely or exercising collective bargaining activities.

14. Harassment, abuse and disciplinary actions. IKEA suppliers shall not engage in public punishment or allow harassment and abuse in their workplace.

The unique component of IKEA's IWAY Standards is the fact that it reaches past first-tier suppliers. Darnall, Jolley, and Handfield (2008) explain that direct environmental impacts originate from a firm's first-tier suppliers and stem from inputs that increase waste during storage, transportation, processing, use, or disposal. Indirect environmental impacts refer to a firm's second-tier suppliers who produce inputs for the first-tier supplier, which have an indirect impact on the final producer's environmental impacts (Darnall et al., 2008). Organizations that adopt sustainability efforts focussed on reducing environmental impacts generally only focus and evaluate their first-tier suppliers (Darnall et al., 2008). IKEA is unique as IWAY Standards mandate first-tier suppliers to implement said standards to second-tier suppliers and beyond.

IKEA has also adopted the IWAY Forestry Standard as a part of the IKEA supplier code of conduct which sets out the minimum criteria for all wood products supplied to IKEA (IKEA Group, 2014). These criteria include not harvesting by illegal methods, from operations involved in forest-related social conflicts, or from areas identified as Intact Natural Forests (INF). IKEA also requires from their wood suppliers that they have a process in place to implement these standards throughout their supply chain and to keep record of the origin of their wood. IKEA is also a member of the Forestry Stewardship Council (FSC) which aim to protect diversity, ensure forest regrowth, protect the rights and needs of people who work and live in the forest, and to stimulate economic development (Forestry Stewardship Council, 2017). IKEA goal is to become forest positive by 2020 – meaning that they are committed to promote sustainable forestry across the industry and beyond their needs.

5. CONCLUSIONS :

- The environmental and social burdens caused by governmental, manufacturing, services, profit and non-profit organizations will continue to exist.
- The source and management of these environmental and social burdens is not the sole responsibility of one organization; whole supply chains and networks of supply chains must be involved.
- Research in understanding the roles, management, tools, and mechanisms for sustainable supply chains must be augmented in order to help meet these challenges.
- One glaring and disconcerting issue remains. Even though many supply chains begin and increasingly also end in Asia or in developing countries, we did not receive nor accept many papers on this topic from those regions of the world.
- A major part of manufacturing and service provision in Asia is carried out by small and medium-sized enterprises (SMEs). These SMEs often form critical parts of the supply chains with larger organizations.
- Tremendous opportunities exist to influence the operating practices and technologies of SMEs to incorporate environmental and social initiatives.
- Taking advantage of such opportunities to incorporate sustainable practices can be very effectively achieved through sustainable supply chain management.
- Based on our sample of contributions, there is a lack of rigorous research by researchers who are geographically located in these areas, as well as research that focuses on these regions of the world.

- In particular, because we do not have a paper from this geographic area in our special issue, we especially encourage researchers in this part of the world to take part in the process, and invite established researchers in other parts of the world to work with researchers in these geographic regions.
- We especially encourage partnerships with researchers in developed and developing countries where resources can be shared and knowledge exchanged so that future research becomes publishable in the most influential academic and professional journals.
- We do not know the reasons for the dearth of this type of research in these regions, but a call for additional research in this area is clearly needed.

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