



EXTERNAL ENVIRONMENTAL PRESSURES AND SUSTAINABLE INNOVATION: THE ROLE OF RESOURCE SCARCITY IN A SWEDISH MULTINATIONAL ENTERPRISE

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Abstract

As more firms become increasingly aware of sustainability, there is a growing focus on sustainability-oriented innovations. However, it has been observed that most sustainable innovations primarily address the environmental pillar, rather than encompassing the full scope of the triple bottom line (TBL), which includes environmental, social, and economic dimensions. This study offers an empirical exploration of the challenges faced by multinational enterprises (MNEs) in the external environment while pursuing their sustainability innovation goals through the lens of the TBL framework. A case study of a Swedish MNE, Alfa, was conducted using qualitative semi-structured interviews. The study expands existing knowledge on sustainable innovations by incorporating a comprehensive understanding of how various forms of resource scarcity beyond just natural resources shape MNEs' sustainable innovation strategies.

Keywords

Triple Bottom Line, Scarcity of Resources, Sustainability, Sustainability Knowledge, Time Constraint, Skilled Human Resources

1. Introduction

In an era of global challenges, with increased awareness of sustainability and the need to address issues such as environmental pollution and climate change, businesses face unprecedented challenges in pursuing sustainable innovation (SI). As multinational enterprises (MNEs) strive to meet sustainability goals, they must navigate complex resource scarcities that threaten their ability to innovate and adapt to a fast-changing global landscape. During the last three decades, sustainable awareness has increased and motivated businesses to find solutions to attain sustainability-oriented growth through business transition with the help of innovation (Adams et al., 2016). Hence, the sustainable innovation (SI) concept was presented and interpreted as innovations that elevate the positivity of environmental, social, and economic factors by linking new or upgraded processes with products, services, and organizational and marketing methods (Aka, 2019). The concept of sustainability was initially discussed in 1987 at the World Commission on Environment and Development (WCED) with the Brundtland Report (Lopes et al., 2022). More recently, Wang et al. (2022) defined SI as approaches for firms to achieve ecologically sustainable goals by linking ideas, behaviors, and processes. Consequently, the more an economy invests in innovation, the more sustainability outcomes can be achieved (Kekkonen et al., 2023).

In the present world where societies are expressing concern about resource exhaustion, environmental degradation, and social disparities, SI focuses on an optimistic and proactive approach towards the future (Weidner et al., 2021). But, for a firm, it is impossible to operate in a vacuum as an

independent agent, as the macro environment influences the firm's decisions and strategies (Fu et al., 2021). Here, we recognize the external environment as the factors in the business environment, including both the macro and micro environments, that can influence business decisions but are incapable of being controlled by the business itself. Foxon and Pearson (2008) and Seuring and Gold (2013) also pointed to the influence of the external environment on a firm's SI. On the other hand, Cillo et al. (2019) discussed the external relational perspective and specified stakeholder involvement and how stakeholders influence a firm's sustainability initiatives. Further, Wang et al. (2022) discussed the SI characteristics of "dual externalities," which specified that external institutional pressure and stakeholder relationships influence a firm's SI. For instance, system pressure from regulatory departments and governments, such as providing financial funds and introducing subsidies to sustainable innovative enterprises, and pressure from stakeholders, competitors, and customers are key influencing factors for a firm's SI (ibid.). Therefore, firms must collaborate with relevant external actors and stakeholders to seize opportunities, which is quite challenging.

Accordingly, once a firm starts to implement SI strategies, the firm must deal with challenges of the external environment in several ways, with the challenge of scarcity of resources grabbing significant attention. Although resource scarcity was mostly connected with natural resource depletion in general terms, insufficiencies in other resources as well block the path to attaining SI goals. Supporting this, a recent study by Singh and Maheswaran (2023) highlighted barriers related to employees and workplace conditions arising from digitalization, and suggested training programs as a solution (Ketata et al., 2015). Simultaneously, Kekkonen et al. (2023) claimed the absence of consumer demand and a lack of long-term strategy as challenges of green transitions in Estonia, illustrating insufficiencies in knowledge and expertise, resistant attitudes of employees, and limitations in financing access. Further, Hargadon (2015) recognized the direct and indirect impact of SI challenges in an external environment where nonrenewable resource scarcity was highlighted. Consequently, it is understandable that resource scarcity plays a broader role as a challenge for SI in an external environment that is developing due to the evolving nature of SI (Nasiri et al., 2021; Keranen et al., 2021). Hence, it is important to investigate whether resource scarcity is an external environmental challenge that influences firms to achieve their SI goals.

On that account, this study aims to explore how MNEs' SI is influenced by the scarcity of resources as an external environmental challenge. We pose the following research question to investigate the scarcity of resources as an external environmental challenge that MNEs face: How does the scarcity of resources as an external environmental challenge influence MNEs' sustainable innovation? This question will be investigated through the case study of a Swedish MNE.

2. Literature Review

2.1 Sustainable innovation

Innovation can be defined as the capacity of an organization to create new offers or improve existing offers by applying new combinations of inputs or incorporating additional attributes that align with evolving market demands (Lopes et al., 2022). It can also be explained as finding unreached market needs, which enables the implementation of creating new products by utilizing new ideas (ibid). Whereas Weidner et al. (2021) defined SI as "new or improved products, services, or processes aimed at social equity and environmental integrity without sacrificing economic prosperity (p.141)." The two definitions can be combined to provide the hybrid version of SI.

A firm's SI ability can vary from insignificant operational changes to advanced disruptive changes (Evans et al., 2017). Firms often proactively take SI initiatives in areas of business operation that require improvements (ibid). According to Nidumolu et al. (2015), one of the main drivers of SI is the transformation of the business model. Firms often take measures for SI because of the pressure from customers and stakeholders (Choi & Ng, 2011). SI-based business models allow firms to tackle stakeholder pressure and create a competitive advantage (Nidumolu et al., 2015).

2.2 External environment

Once a firm is engaging in operations, it must operate in an environment that impacts the decision-making process (Fu et al., 2021). For success, firms need to assess the volatile external environment and estimate the availability of resources for smoothly running the operations of the business (Seuring & Gold, 2013). Based on the external environmental assessment, firms need to take adjustment measures through innovation to operate and reach their visionary objectives (Fu et al., 2021).

According to Ketata et al. (2015), regulations, which are generally called regulatory push, are the main component of the external environment that initiates SI. Also, stakeholders such as consumers have the power of influence because consumers' acceptance of innovations by purchasing sustainable products or services creates customer satisfaction and customer loyalty (de Medeiros et al., 2014). So, when the demand for SI increases, firms can gain high customer loyalty, and conversely, firms may have lower customer loyalty if they are not positively fulfilling customers' SI demands (Ketata et al., 2015). Further, firms that incorporate social responsibility are capable of gaining the trust and support of stakeholders, enhancing their resources, improving reputation, developing social influence, and contributing to sustainable development (Wu & Jin, 2022).

2.3 External challenges for sustainable innovation

According to Runde (1998), situations of risk can be specified as situations where the decision-maker assigns probabilities to events based on known chances, and situations of uncertainty focus on situations where the decision-maker is unable to assign probabilities to events because it is not possible to calculate chances (p. 540). Since innovation is described as a risky fact that involves an uncertain process and outcome (Madanaguli et al., 2023), SI also includes the same characteristics, which make it challenging to achieve. Hargadon (2015) specifies uncertainties related to policy, technology, resources, industry, and market as the main external challenges for implementing SI. Another critical challenge that is particularly specific to MNEs is the adaptation of policies and strategies that are taken by headquarters in their subsidiaries in different countries with different policies, cultures, and customers (Le & Liao, 2018). Most importantly, the scarcity of resources has been studied by several scholars as a challenge of SI in the external environment, where the scope covers a broader area of resources: raw materials, including natural resources, social resources, human resources, and knowledge (Hargadon, 2015). As this study investigates the scarcity of resources as an external environmental challenge of SI, the next section of literature review is focused on the scarcity of resources as a challenge.

2.3.1 Scarcity of resources as a challenge

In accordance with Hargadon (2015), even though resources cover broader area, companies depend on inputs to continue business processes. Firms which use nonrenewable resources such as coal and crude oil as raw materials for production, are facing issues related to business continuation because of the scarcity of these resources (ibid). Ruichen (2023) highlighted the integration of 10 Rs which refers to respect, refuse, reduce, reuse, recycle, responsibility, rethink, replace, repurpose, and restore with all type of MNEs to find solutions for these challenges by showing how MNEs can use 10 Rs as a reference in developing companies' transformation strategies of sustainability to reduce expenses and carbon footprint, recycle and reuse resources. Kadambala et al. (2017) critically discussed the higher efficiency of re-manufacturing over recycling by emphasizing that reverse supply chain based on collecting reused products from customers is time consuming and creates less value addition if high valued products are recycled. Additionally, Keranen et al. (2021) mentioned a challenge of lowering carbon footprint and transportation cost due to not having nearby central actors such as suppliers. For instance, if a company must use nonrenewable raw materials which are not available locally, it will be costly to proceed.

Hargadon (2015) also discussed about social resources where firms are facing social contradictions while explaining that cigarette manufacturers who still have end users, losing customer base with the public tolerance (ibid). Similarly, MNEs such as Pepsi-Cola, Coca-Cola, Unilever and Nestle are facing this challenge due to sugar free market trends (ibid). Moreover, Nike and Adidas had to deal with pressure from community due to labor abusing and environmental laws in developing countries like Vietnam (ibid). Consequently, failures in managing such challenges will result in reputation damage, lower sales and profit losses.

In terms of human resources and knowledge, Singh & Maheswaran (2023) found the work circumstances as the most prominent and employment disruptions as the second most prominent barriers for SI. They explained that with digitalization, the work force should be leveled up with new knowledge and skills to cooperate with new sustainable strategies or otherwise companies must bear the cost of lacking skillful workforce (ibid). Further, if that may not happen timely, it can cause for leaving of unskillful employees from companies (ibid). Ketata et al. (2015) also specified that unless employees are provided training on understanding the necessity of sustainable innovation, the employees may not be willing to engage in sustainable innovation practices. Anand & Singh (2021) also provided a supportive explanation for this discussion by exemplifying the firms that take care of their employees' wellbeing by

providing a better work environment, will attain lower amount of absenteeism and increase the profitability with higher productivity and workforce loyalty.

Further, to solve these challenges, firms have taken corporate social responsibility actions which are also known as social sustainability (Roberts & Tribe, 2008). According to Wu & Jin (2022), CSR ensures firm's commitment towards society and creates trust for the firm among the stakeholders. But again, to achieve these CSR goals, it is necessary to have management commitment and resource allocation, but challenges may arise once the firms try to balance government regulations, social needs and business itself (Anand & Singh, 2021).

2.4 Multinational corporations (MNEs)

One of the main forces of the economic expansion is identified as Multinational corporations because they move internationally, over the national boundaries and simultaneously, they do the major role in populating sustainability (Korten, 1998). Therefore, some scholars such as Choi & Ng (2011) stated that these MNEs should take stable actions to adopt environmental sustainability. In accordance with Korten (1998), MNE management must not limit on concentrating short term economic benefits but should preferably expand their sustainability initiatives to cover productive social and environmental results.

MNEs with foreign direct investments, high revenue income and employment creation often have a media presence (Ketata et al., 2015). During the period of COVID-19, many global companies have adopted environmentally friendly strategies; for instance, retailers like Tesco, Sainsbury and Aldi went for technological advancements to speed up their e-commerce platforms (Ruichen, 2023). Therefore, many MNEs focused on environmental and social sustainability measures and invested on sustainable business operations (Bansal, 2005).

2.5 Sustainability

After the appearance of sustainability as a concept at WCED, scholars gave identical interpretations to it. Aminpour et al. (2020, p. 35), interpreted sustainability and sustainable development as the "development which meets the needs of the present without compromising the ability of future generations to meet their own needs". In the World Summit on Social Development in 2005, environment, society, and economy were included in the sustainability discussions. (ibid). These changes of sustainability in the economy always secure human and natural resources and produce profits (Sabatini, 2019). Measures related to environment and society creates the pathway for economic growth (Placet et al., 2005). For instance, if the productivity of resources is increased by means of sustainable materials and reducing waste, the production cost will be decreased and as a result the profitability will be increased (ibid). Hence, it is important for a firm to weigh up the facts such as influence of firms practices on public, environment and company employees as equally as they are focusing on gaining profits through stakeholders' wealth (Hossain, 2021).

As Bhattacharya et al. (2020) identified sustainability as the driver of the competitive advantage. Similarly, Park (2019) specified sustainability as the perception and reputation builder for the firm among stakeholders. In line with Gebauer et al. (2021), the integration of sustainability into organizational strategies can generate multiple sources of competitive advantage. These benefits include increased profitability, improved product quality, greater employee satisfaction, enhanced brand reputation, cost reductions achieved through sustainable practices, and stronger support from governmental policies and regulations. Moreover, sustainability initiatives contribute to environmental protection and social welfare, which collectively strengthen a firm's long-term competitive position (Afeltra et al., 2023).

2.6 Three dimensions of sustainability

In 1997 the triple bottom line (TBL) concept was proposed focusing on the three aspects that firms need to consider for sustainability that are people, planet and profit (Tseng et al., 2020). TBL provides a multidimensional sustainability guideline for business firms focusing on social, environmental, and economic attributes (Wu et al., 2018; Tseng et al., 2020; Weidner et al., 2021).

Environmental sustainability has emerged as a fundamental driver for the development of green innovations among business organizations aiming to meet evolving consumer demands (Albino et al., 2009). There are two benefits of environment friendly to the companies, first is the commercial advantage which is incurred by producing ecofriendly products and second is the economic advantage which gains through competitive advantage (Albort-Morant et al., 2016).

Social sustainability is often explored through the view of corporate social responsibility (CSR) (Roberts & Tribe, 2008). CSR refers to the responsibility of firms to safeguard and enhance the present and

future welfare of society and organizations through diverse business and social initiatives, while ensuring equitable and sustainable value for multiple stakeholders (Wu & Jin, 2022; Kotler and Lee, 2005). To achieve the CSR goals, it is necessary to have management commitment and resource allocation, but challenges may arise once the firms try to balance government regulations, social needs and business itself (Anand & Singh, 2021). However, by implementing successful CSR firms are capable of gain trust and support of stakeholders, enhancing their resources, improving reputation, developing social influence and contribute to sustainable development (Wu & Jin, 2022).

In accordance with Sabatini (2019), the changes of sustainability in the economy always secure human and natural resources and produce profits. The effective implementation of the environmental and social pillars of sustainability can reinforce the third pillar—economic growth (Placet et al., 2005). For instance, enhancing resource productivity through the adoption of sustainable materials and waste reduction practices can decrease production costs and consequently improve organizational profitability (ibid). Likewise, if firms take care of their employees' wellbeing providing a better work environment, the number of absenteeism will reduce and again the profitability will be increased with higher productivity and workforce loyalty (Anand & Singh, 2021).

3. Methodology

This study adopted a qualitative research method as qualitative studies allow researchers to obtain detailed insights necessary for an exploratory study (Easterby-Smith *et al.*, 2018; Stebbins, 2001). Qualitative research is widely used in the social sciences and humanities (Golafshani, 2015) and is particularly appropriate when the aim is to understand specific circumstances, subjective perspectives, and phenomena within their contextual settings (Miles and Huberman, 1994; Yin, 2013). In line with this perspective, the present study adopts an inductive research approach. Inductive approaches are commonly associated with qualitative data collection methods, as they allow research questions to be explored in depth and enable a more comprehensive understanding of the research phenomenon (Bryman, 2016; Easterby-Smith *et al.*, 2018; Hyde, 2000). Accordingly, the data collected from respondents were systematically organized and analyzed following this approach in order to address the research questions (Easterby-Smith *et al.*, 2018).

The case study method was adopted in this study as it allows researchers to focus on a specific context and examine a phenomenon in depth (Yin, 2013). As noted by Yin (2013), case study research enables the collection of detailed information about particular circumstances, thereby supporting the exploration, description, and explanation of the phenomenon under investigation.

3.1 Selection of case firm

To protect the anonymity of the firm, which was the base of the case study, term “Alfa” is synonymized for the company name for further discussion (Korstjens *et al.*, 2018; Saunders *et al.*, 2014). Alfa is a global engineering company with operations spanning multiple business areas, including tools and tooling systems for industrial metal cutting, equipment and technical solutions for the mining industry, tools and services for the construction sector, and stainless-steel expertise for industrial applications. Creating work environment for 40,000 employees worldwide with operations in South America, Asia, Africa, and Australia and headquartered in Stockholm, Sweden, Alfa has business growth of 8% annually.

We selected the Alfa for our study by considering several reasons. Alfa was selected for this study for several reasons. First, Alfa's presence in the engineering sectors of mining and construction aligns closely with the research focus on sustainability and innovation. These sectors are particularly exposed to environmental, social, and economic challenges, which form the basis of the identified research gap. Second, companies with strong research and development (R&D) infrastructure are generally more effective in innovating new products and services. According to Alfa's 2024 company profile, approximately 4.1 billion Swedish Kronor has been invested in R&D. Third, Alfa has a dedicated sustainability department responsible for managing environmental, social, and economic initiatives across business processes and organizational units. As noted by one of our interviewees, this department also plays an active role in the company's decision-making processes.

3.2 Data Collection

According to Golafshani (2015), interviews and descriptive analysis are widely used methods in qualitative research. In this study, interviews served as the primary data collection method, as they allow for the collection of first-hand, authentic information from respondents through extensive and in-depth

discussions, thereby enhancing the reliability and rigor of the analysis. In exploratory research, semi-structured interviews are particularly effective for understanding the relationships between variables (Saunders et al., 2009). Consequently, a combination of structured and unstructured questions, semi-structured interviews—was employed. This approach enabled respondents to express their perspectives comprehensively while sharing practical insights and experiences (McIntosh and Morse, 2015).

According to Knapik (2006), participant selection is a critical aspect of the interview process, as gathering information from relevant authorities is essential for ensuring the validity of the research. Accordingly, purposive sampling was employed to select interviewees from the sustainability, research and development, and production departments, which were directly relevant to the study's scope (Etikan et al., 2016). By conducting interviews with respondents from multiple departments at Alfa, the study was able to capture diverse patterns of sustainable innovation (SI) across the organization, as summarized in Table 1.

Table 1: Overview of respondents and interviews

Respondents	Position	Years working at Alfa	Interview Duration
R1	Head of Governance and Sustainability	18 years	43 min
R2	Program Manager Sustainable Business	3 years	52 min
R3	Junior Sustainability Specialist	6 months	40 min
R4	Senior Product Developer, R&D	13 years	44 min
R5	Senior R&D Engineer	8 years	49 min
R6	Global Compensation and Benefits Director	10 years	39 min
R7	Global Inventory & Supply Planner	5 years	42 min

R: Respondent

3.3 Data Analysis

The collected data were analyzed using a thematic approach to identify patterns and themes relevant to the study's objectives (De Paoli, 2024; Naeem et al., 2023). Analysis involved examining exemplary quotes from interview recordings to develop subthemes that reflected the content of the participants' responses (Easterby-Smith et al., 2018). Based on the relative significance of these subthemes, the main themes were finalized to address the research questions and to facilitate discussion in relation to the reviewed literature (De Paoli, 2024; Easterby-Smith et al., 2018; Naeem et al., 2023). Through this process, the findings were organized into two main themes including one central challenge for SI supported by several subthemes to provide a detailed discussion (Easterby-Smith et al., 2018). The main themes and sub themes are shown below:

- Main themes: Sustainability, Innovation, Scarcity of resources
- Subthemes: Nonrenewable raw materials, Human resource inefficiencies, Sustainability unawareness, Time constraint

The process is shown in Table 2 (De Paoli, 2024; Easterby-Smith et al., 2018; Naeem et al., 2023).

Table 2: Identified themes

Themes	Developed subthemes	Emphasis of illustrations	Exemplified quotes from interviewees
Sustainability Bhattacharya et al. (2020)	TBL Wu et al. (2018); Tseng et al. (2020)	Reflecting the attempts to achieve sustainability with three dimensions of environment, social and economy.	<i>In 2019 we developed sustainability shifts under 4 areas, we have circularity, climate, people and fair play.</i>
Sustainability Placet et al. (2005)	Positive impacts of sustainability Park (2019)	Reflecting the importance of sustainability.	<i>Once the sustainability goals are met, they work as competitive advantage.</i>
Sustainability Wilson (2015)	Positive impacts of sustainability	Reflecting the positive impact of recycling and buyback process.	<i>Our process of recycling and program of buyback are plus points for sustainability.</i>

	Gebauer et al. (2021)		
Sustainability Placet et al. (2005)	Sustainable implementations Afeltra et al. (2023)	Reflecting how firm implement strategical sustainable solutions.	<i>Alfa decided to work from home for two days per week even after the pandemic to line up with sustainable goals. Because it decreases CO2 emission and increases work life balance. And we shifted to having digital meetings with subsidiaries instead of flying over boundaries.</i>
Innovation Lopes et al. (2022)	Positive aftermath of innovation on sustainability Hargadon, (2015)	Reflecting how firm's innovations are supported to sustainability goals.	<i>With the innovation of enhancing life expectancy of products, sustainability goals are attained with lowering environmental impacts.</i>
Innovation Lopes et al. (2022)	Innovations towards sustainability Evans et al. (2017)	Reflecting the sustainability oriented innovative attempts which are in progress	<i>Alfa is trying to develop new products which are recyclable, and use recycled raw materials.</i>
Scarcity of resources Hargadon, (2015)	Nonrenewable raw materials and Recycling (Ruichen, 2023)		
Innovation Lopes et al. (2022)	Nonrenewable raw materials and sustainably innovative solutions Ruichen (2023)	Reflecting the attempt of solving challenge of raw material declination by expanding the lifecycle of products and its positive impact.	<i>We are trying to improve products in terms of life cycle. For example, a product with a lifespan of 20 minutes to bring it to 25 minutes is a huge challenge. But by achieving it, we can reduce material usage for another product.</i>
Scarcity of resources Hargadon, (2015)			
Sustainability Bhattacharya et al. (2020)	Positive strategical implementations Ruichen (2023)	Reflecting the positive impacts of repurchasing strategy for customers and company itself.	<i>The strategy of repurchasing is a win-win situation for both customers by receiving discounts for their next purchase and for us by collecting materials and achieving sustainable goals.</i>
Scarcity of resources Hargadon, (2015)	Nonrenewable raw materials and Buy back process Kadambala et al. (2017)		
Scarcity of resources Hargadon, (2015)	Sustainability unawareness Le & Liao, (2018)	Reflecting on the difficulty of achieving sustainable goals due to characteristics of suppliers.	<i>In determining the footprint of final packaging, we are facing a challenge to get exact numbers as suppliers are not 100% aware of their footprint.</i>
Scarcity of resources Hargadon, (2015)	Human resource inefficiencies Singh & Maheswaran (2023)	Reflecting the challenge of gap knowledge required for SI and knowledge already acquired by the employees.	<i>The knowledge of sustainable business models should be educated to all and every employee to understand their task roles.</i>
Scarcity of resources Hargadon, (2015)	Human resource inefficiencies	Reflecting the knowledge gap of current employees and new	<i>The knowledge gap of sustainable innovation between current employees</i>

	Singh & Maheswaran (2023)	recruiters who are recent graduates.	<i>and new recruiters needed to be fixed. As the new graduates are educated on sustainable engineering skills at universities.</i>
Scarcity of resources Hargadon, (2015)	Time constraint Anand & Singh (2021)	Reflecting on time as a new challenge.	<i>Other than only emphasizing on so called resources, for example raw material, human resources and knowledge, we should think of time as an important resource for achieving sustainable goals.</i>

4. Empirical Findings

The empirical findings are shown under two main criteria. They are sustainability and innovations, and scarcity of resources as an environmental challenge.

4.1 Sustainability and Innovation

According to the respondents, they recognized the importance of sustainability as a strategic concept and acknowledged its critical role in maintaining long-term business viability. They further identified sustainable strategies as a source of competitive advantage, enabling the company to strengthen its position and remain resilient in the market. Alfa understood the clarification between the environmental aspect of sustainability and sustainability as a whole concept including three dimensions. They shifted sustainable goals in May 2019, emphasizing TBL and implemented strategic objectives with categories of climate, circularity, people and fair play. Within the context of responses gathered, the higher management has also actively recognized the TBL concept. R3 confirms:

“Alfa’s sustainability is not limited to environment aspect, what we called as climate goal. We have expanded our goals to other areas, we have goals of people, we have circularity, we have [...] our sustainable shift pushes the company to achieve its sustainable goals in a broaden way, which is the prime necessity for actual sustainability”.

To attain these broadened sustainable goals, Alfa has implemented several methodologies; for instance, waste recycling, enhancing product life cycle, work from home and repurchasing used products as per interviews. Doing so, respondents claim that Alfa created a way for sustainability, but the factor of innovation is a must. As R2 commented:

“Our innovation projects are taking the directions of sustainability [...] we have reached at the level of using over 80% of recycled raw materials now”.

Furthermore, in the context of innovation, firms’ R&D efforts consistently assess the sustainability impact of their initiatives. For example, the adoption of additive manufacturing technologies has been used to reduce material waste and minimize environmental impact. Likewise, Alfa is engaging in sustainability-oriented innovation projects such as electrification of fossil-based engines, searching for new business opportunities and improving productivity; enhance product lifecycle, improve output, reduce waste, and reduce energy consumption which are environmentally healthy. As R7 highlighted:

“Innovation plus sustainability has not only benefits what we see directly [...] with the enhance of life expectancy of end product [...] directly increases the period of product usage and reduce the number of times of purchasing another product. But indirectly, we create co-benefits in terms of climate by less shipping, less packaging and less raw material. This hits positively on economic and social aspects as well”.

Consequently, based on the interviews, innovation was described as performing activities in a more efficient and novel manner, a practice that has evolved over the past century or more. However, although

innovation is a critical factor for achieving sustainability, it remains essential to clearly define what constitutes “innovation for sustainability,” as this is a complex and multifaceted concept.

4.2 Scarcity of resources as an external environmental challenge

In accordance with findings, Alfa is facing challenges of scarcity of resources in various ways. Nonrenewable raw materials, human resource inefficiencies, sustainability unawareness and time constraint were the discovered barriers and will be illustrated with the solutions made by the Alfa. Cobalt, one of the most critical raw materials for production, is found in significant quantities primarily in China and the Democratic Republic of Congo. But the political incompatibility of these countries with Sweden makes a challenge to get them while it is also difficult to alternate another material which supports for sustainability. Consequently, the portion of direct cost for raw materials is being increased. To fill out this scarcity, Alfa implemented buy back process which is sustainable oriented as they can gain Cobalt and Tungsten from used products. As R4 claimed:

“To secure scarce amount of Cobalt, Alfa has buy-back strategy [...] a win-win scenario, both customer and us. It benefits us by giving Cobalt which also recycled and on the other hand, for customers, they receive discounts for next purchase if they return old one”.

Another implementation to reduce usage of raw materials is innovations on the product lifespan to expand the life cycle as mentioned in the previous section. If the product has a lifespan of 20 minutes and by extending it to 25 minutes, reduce the number of purchases in total.

Once the used products are bought back, Alfa should recycle them to attain their goals. Therefore, the recycling can be recognized as the main contributor for the future of Alfa. As R1 explained:

“Recycling is becoming greater and greater important for us as the natural materials are finite. Our target is to achieve 90% circularity in our process at the end of 2030 [...] circularity functions under three segments; customers, operations and suppliers”.

Regarding customers, Alfa has implemented a sustainable business model designed to minimize waste by incorporating a buyback process for used tools. In terms of operations, all development projects have part of improving efficiency of materials and resources with the support of research and development department. As environmental and economic sustainability serve as key drivers for recycling, circularity and resource recovery are embedded within the firm’s business model. At the same time, the research and development (R&D) department focuses on innovating new products and processes with a strong sustainability orientation. Consequently, the firm is not only developing new products but also exploring methods to conserve energy and reduce environmental pollution in its manufacturing processes. In terms of suppliers, as mentioned previously by exemplifying China and Congo, Alfa face challenge of acquiring resources because goals were set for achieving 90% circularity for key suppliers. Accordingly, firm’s raw material procurements are dealt only with suppliers who have sustainability consideration in their operations. Alfa has also put their considerations on tracking their progress in relations with obtaining goals in 2030. Doing so, operational waste reduction targets are set up and updated annually compared with previous year.

While Alfa is implementing sustainable strategies of buyback process and recycling to win scarcity of resources challenge, they recognized another challenge in relations with knowledge of SI. The concept of sustainability popped up a few decades ago and is still being developed and evolved by adding new knowledge to the scope. For that reason, the educational and skilled gap of SI between old employees and new employees who are recent graduates is highly remarkable, particularly in engineering sections.

On the other hand, as long-standing employees are accustomed to traditional frameworks, it can be challenging for them to adopt and internalize new, unfamiliar innovation knowledge. As R5 illustrated:

“If a process is being done from right to left for years, the audience is not ready to accept the next process from left to right even though it is more sustainably efficient [...] once some knowledge is learned, it is really hard to unlearn or amend it [...] in term of knowledge, reaching 0 to 95 is easier but from 95 to 96 it becomes harder to push your capacity because you should have in depth knowledge and extra time for achieving it”.

Furthermore, there is a need for highly qualified recent graduates with education in SI; however, the findings indicate a shortage of such graduates, while Alfa also requires advanced engineering competencies. Further due to these knowledge gaps, employees face issues of understanding task roles of their designations hence the requirement of education about sustainable business model was suggested by the respondents.

As highlighted in previous discussion, from the suppliers' point of view, the sustainable oriented knowledge is also insufficient because Alfa is facing difficulty counting the exact footprint of their final products. Therefore, effective knowledge sharing can help mitigate these challenges. Similarly, from the customers' perspective, providing guidance on the efficient use of tools and machinery can enable end users to reduce energy consumption and extend product lifespan.

Since the knowledge regarding SI is evolving every time, a considerable period is taken to learn and share the knowledge of SI. AS R3 highlighted:

"The time limitation to engage in sustainable oriented learning while working towards to other targets is challenging for me personally".

Therefore, time was recognized as another resource which is a challenge with its characteristic of shortage to implement.

5. Discussion

This study examined resource scarcity as an external environmental challenge shaping SI in MNEs, drawing on empirical evidence from a leading Swedish MNE. The findings suggest that resource scarcity in the context of SI should not be understood solely by the declining availability of natural resources. Rather, it constitutes a multidimensional constraint encompassing the availability of nonrenewable raw materials, human-resource and knowledge deficiencies, limited sustainability awareness among external stakeholders, and temporal constraints. Taken together, these findings indicate that resource scarcity influences not only firms' access to physical inputs but also their capacity to develop, coordinate, and implement sustainable innovations.

A prominent manifestation of resource scarcity concerns the availability and sourcing of nonrenewable raw materials. Previous research has emphasized that dependence on finite resources can create uncertainty regarding the continuity of production (Hargadon, 2015). The findings from Alfa provide empirical support for this argument. The company's dependence on cobalt exposes it to challenges associated with geographical concentration, transportation requirements, environmental impacts, and continuity of supply. As cobalt is predominantly sourced from geographically distant markets, including China and the Democratic Republic of Congo, its procurement may simultaneously increase economic costs and the carbon footprint associated with transportation (Keranen et al., 2021). Resource scarcity therefore emerges not simply as a procurement problem but as a strategic sustainability challenge connecting material availability, supply-chain dependence, environmental performance, and innovation.

Importantly, the findings also demonstrate that scarcity can stimulate organizational responses that generate new forms of value. Alfa's buyback and recycling initiatives illustrate how constraints on virgin materials can encourage circular approaches to resource utilization. These practices are consistent with the principles of the 10Rs framework (Ruichen, 2023) and with broader arguments concerning closed-loop production and the circular economy (Adams et al., 2016). The buyback system is particularly noteworthy because it simultaneously creates incentives for customers to return used products and enables Alfa to recover materials while potentially reducing transportation requirements and dependence on virgin resources. In this respect, resource scarcity operates not only as a barrier to SI but also as a stimulus for the development of circular business practices.

This finding also provides a useful qualification to the critical assessment of reverse supply-chain inefficiencies presented by Kadambala et al. (2017). Whereas reverse logistics may generate operational inefficiencies under some conditions, the Alfa case indicates that an appropriately designed incentive structure can potentially transform product returns into a strategic resource. The combination of customer incentives, material recovery, cost considerations, and Alfa's ambition to achieve 90% circularity by 2030 suggests that reverse flows can become integral to an organization's sustainability strategy rather than functioning merely as an operational burden. The broader implication is that the effect of reverse supply chains on SI may depend on how effectively firms align economic incentives with circularity objectives.

The empirical findings further demonstrate that Alfa's response to material constraints extends beyond recycling to product and process innovation. The company's efforts to extend product life cycles correspond closely with the eco-design principles discussed by Klewitz and Hansen (2014), particularly product durability, longevity, reduced resource consumption, and recyclability. This indicates that resource scarcity can influence innovation at multiple stages of the product life cycle rather than only at the point of raw-material procurement. Moreover, Alfa's R&D activities encompass not only product innovation but also process and organizational innovation, including initiatives aimed at energy conservation, waste reduction, digitalized customer interactions, and remote working practices. The presence of three of the four innovation categories identified by Lopes et al. (2022) reinforces the proposition that sustainability-related resource pressures can produce organizational responses extending beyond technological product development.

The second major dimension concerns human-resource and knowledge constraints. The findings reveal a tension between sustainability-related knowledge and accumulated professional experience. Newly graduated employees may possess contemporary sustainability knowledge while lacking substantial practical experience, whereas experienced employees may possess extensive operational expertise but have more limited exposure to emerging sustainability concepts. This creates a potentially important knowledge asymmetry within organizations. Consistent with Singh and Maheswaran (2023) and Ketata et al. (2015), the findings therefore suggest that the challenge is not simply a shortage of employees, but a mismatch between the forms of knowledge and expertise required for SI and those currently distributed across the workforce.

This distinction has important implications. Recruiting sustainability-oriented employees alone may not resolve the problem if experiential knowledge remains disconnected from contemporary sustainability expertise. Conversely, relying exclusively on experienced personnel may constrain the adoption of emerging sustainability practices. Training, education, and internal knowledge exchange therefore become mechanisms through which complementary forms of expertise can be integrated. From this perspective, human-resource scarcity in SI is better conceptualized as a problem of availability, distribution, and integration of relevant knowledge and capabilities, rather than merely as a numerical shortage of personnel. The observed shortage of graduates specializing in SI further reinforces the need to examine the development of sustainability-related human capital.

A third dimension of resource scarcity arises from the firm's dependence on external stakeholders. Adams et al. (2016) emphasizes the importance of interactions with customers and suppliers for successful SI, and the present findings support this relational perspective. Alfa's sustainability objectives depend partly on whether suppliers possess the capabilities and knowledge required to meet their sustainability expectations. The company's assessment of potential partners' sustainability capabilities illustrates how environmental objectives are increasingly incorporated into supplier selection and interorganizational relationships. At the same time, Alfa's continuing difficulty in accurately quantifying suppliers' environmental footprints indicates that stakeholder engagement does not automatically eliminate information and knowledge constraints.

Knowledge sharing with suppliers therefore serves two related functions: it supports the diffusion of sustainability practices while also potentially improving the information required for sustainability-oriented decision-making. A comparable dynamic is evident in Alfa's relationship with customers. Customer-oriented knowledge sharing, including information concerning energy conservation, demonstrates that customers are not simply recipients of sustainable products but participants in the implementation of SI. These findings extend the interpretation of resource scarcity beyond resources controlled directly by the focal firm. For MNEs embedded in complex value chains, the sustainability-related knowledge and capabilities of customers and suppliers effectively become part of the resource environment within which innovation occurs.

Finally, the findings identify time as a particularly important but comparatively underexamined resource constraint. Time differs from the other resources identified in the study because it affects the organization's ability to mobilize them. Developing new technologies, conducting R&D, training employees, transferring knowledge, evaluating suppliers, and implementing circular practices all require sustained temporal commitments. The findings therefore support Walker et al. (2008), who identify limited time as a barrier to corporate engagement with sustainability. More importantly, they suggest that time scarcity may have a cross-cutting effect: insufficient time can intensify human-capital, knowledge, and innovation constraints even where financial or material resources are available.

Taken collectively, the findings suggest that resource scarcity and SI have a more complex relationship than a simple barrier-effect model implies. Resource constraints can inhibit innovation by

limiting access to materials, expertise, stakeholder knowledge, and implementation time. However, those same constraints can also stimulate adaptive responses, including circular business models, product-life-extension initiatives, process innovation, organizational innovation, and knowledge-sharing mechanisms. Resource scarcity can therefore be understood as both a constraint on and a catalyst for sustainable innovation, with the eventual organizational outcome depending partly on the firm's capacity to recognize scarcity, mobilize internal and external capabilities, and translate constraints into strategic responses.

6. Conclusion

This study investigated how resource scarcity operates as an external environmental challenge influencing sustainable innovation in MNEs. Based on an empirical investigation of a leading Swedish MNE, the study demonstrates that scarcity in SI extends considerably beyond the availability of nonrenewable natural resources. The findings identify four interconnected dimensions: constraints associated with nonrenewable raw materials, human-resource and knowledge inefficiencies, limited sustainability awareness among customers and suppliers, and time scarcity.

The central contribution of the study is therefore a multidimensional understanding of resource scarcity in sustainable innovation. While previous research has recognized individual barriers associated with natural resources, stakeholder interaction, human capital, and time, the present study brings these constraints together within a single empirical setting. In doing so, it demonstrates that an MNE's capacity for SI depends not only on access to physical resources but also on access to appropriate knowledge and capabilities, the sustainability competence of actors across its value chain, and sufficient time to develop and implement innovation.

The findings additionally reveal that resource scarcity should not be interpreted exclusively as an impediment to SI. Alfa's responses focussing on recycling, buyback systems, product-life-extension initiatives, process improvements, and knowledge sharing illustrate how resource constraints can encourage strategic adaptation. In particular, circular practices can reduce dependence on virgin materials, while knowledge-sharing mechanisms can partially address capability deficiencies within and beyond organizational boundaries. Thus, the study indicates that the relationship between resource scarcity and SI is potentially dual in nature: scarcity constrains organizational action while simultaneously creating incentives for innovation and reconfiguration.

These findings should nevertheless be interpreted in light of the study's case-based design. Evidence from a single MNE provides analytical depth but limits the extent to which the findings can be generalized across organizations, industries, and institutional environments. Accordingly, the proposed multidimensional interpretation of resource scarcity should be regarded as an empirically grounded basis for further investigation rather than as a universally applicable model.

Overall, this study contributes to SI research by showing that successful responses to resource scarcity require more than securing alternative material inputs. They require coordinated organizational responses involving circular resource strategies, human-capital development, stakeholder engagement, knowledge exchange, and the allocation of sufficient time to sustainability-oriented activities. For MNEs confronting increasingly complex sustainability pressures, the ability to convert resource constraints into opportunities for organizational adaptation may therefore represent an important capability for advancing sustainable innovation.

6.1 Theoretical Contributions

This study contributes to the sustainable innovation literature in three principal respects. First, it broadens the conceptualization of resource scarcity. Resource scarcity is frequently associated primarily with the declining availability of physical or natural resources. The empirical findings indicate that such a conceptualization may be too narrow for explaining the challenges encountered by MNEs pursuing SI. In addition to nonrenewable materials, the case identifies shortages or deficiencies involving specialized human capital, sustainability-related knowledge among internal and external actors, and organizational time. Resource scarcity can therefore be conceptualized as a multidimensional phenomenon comprising material, human-capability, relational-knowledge, and temporal dimensions.

Second, the study contributes to understanding the relationship between resource constraints and organizational responses to sustainability pressures. The findings suggest that scarcity does not necessarily produce a uniformly negative effect on innovation. Although resource limitations create barriers, they can simultaneously motivate firms to develop alternative practices such as recycling, buyback systems, product-

life extension, and knowledge-sharing initiatives. This extends existing discussions of sustainable innovation by highlighting the potentially generative role of constraints: under appropriate organizational conditions, scarcity may stimulate strategic adaptation rather than merely restrict innovation.

Third, the findings emphasize the relational character of resources in MNE sustainable innovation. Consistent with Adams et al. (2016), Alfa's experience demonstrates that SI outcomes depend partly on the sustainability knowledge and capabilities of customers and suppliers. Consequently, the resources relevant to SI cannot be understood exclusively within organizational boundaries. Knowledge and capabilities distributed throughout the value chain influence the focal firm's capacity to achieve sustainability objectives. This finding strengthens a relational interpretation of SI in which internal organizational capabilities and external stakeholder capabilities are mutually consequential.

Taken together, these contributions suggest a theoretical shift from viewing resource scarcity as a predominantly physical and restrictive condition toward understanding it as a multidimensional and relational condition that can simultaneously constrain and stimulate sustainable innovation.

6.2 Managerial Implications

The findings provide several implications for managers responsible for sustainable innovation in MNEs. Most importantly, managers should assess resource scarcity systematically rather than treating it primarily as a raw-material procurement issue. Sustainability strategies should consider the simultaneous availability of physical resources, specialized knowledge and skills, stakeholder capabilities, and organizational time.

For material scarcity, circular strategies such as recycling, product take-back systems, and product-life extension can reduce dependence on virgin resources while supporting sustainability objectives. The Alfa case further suggests that these initiatives are more likely to gain traction when incentives for customers and organizational benefits are aligned. Managers should therefore design circular systems as integrated value propositions rather than as isolated environmental initiatives.

Human-capital constraints require a similarly integrated response. Organizations should seek to combine the practical expertise of experienced employees with the contemporary sustainability knowledge of newer employees. Training, cross-generational knowledge exchange, and sustainability-focused professional development can help reduce internal knowledge asymmetries. Where relevant knowledge is unavailable internally, open sustainable innovation and external collaboration may provide complementary mechanisms for accessing expertise (Urbinati et al., 2023).

Managers should also recognize that sustainability capabilities extend beyond organizational boundaries. Supplier evaluation should incorporate sustainability competencies, while continuing knowledge exchange with suppliers can support improvements throughout the value chain. Customer education and engagement can similarly facilitate more sustainable product use and strengthen participation in circular initiatives.

Finally, time should be explicitly treated as a strategic resource for SI. Sustainability initiatives requiring R&D, employee learning, supplier development, and organizational change cannot be implemented effectively without adequate temporal allocation. Managers should therefore incorporate time requirements into sustainability planning rather than treating SI activities as additional responsibilities to be accommodated within existing workloads.

6.3 Limitations and Directions for Future Research

Several limitations provide opportunities for further research. First, the study is based on a single MNE. Although the case-study design enables detailed examination of organizational experiences with resource scarcity, the findings cannot automatically be generalized to other firms, industries, or institutional contexts. Comparative studies across MNEs, industries, and countries could examine whether the four dimensions identified in this study: material, human-capability, relational-knowledge, and temporal scarcity are reproduced in different settings.

Second, the findings identify unresolved human-resource challenges, particularly the apparent shortage of graduates specializing in SI and differences in sustainability-related knowledge between newer and more experienced employees. Future studies could examine the origins of these capability gaps and investigate how recruitment, training, intergenerational knowledge transfer, and organizational learning influence SI outcomes.

Third, time scarcity warrants substantially greater theoretical and empirical attention. The present findings indicate that time may differ from other resources because it conditions an organization's capacity to develop knowledge, conduct R&D, coordinate stakeholders, and implement sustainability initiatives.

Future research could therefore investigate whether temporal scarcity acts independently as a barrier to SI or interacts with other forms of resource scarcity to intensify their effects.

Finally, the role of digitalization and artificial intelligence represents a potentially important direction for future research. Building on the organizational innovations observed in the case, subsequent studies could examine whether digital technologies help organizations mitigate resource constraints—for example, by facilitating knowledge exchange, improving coordination, or supporting more efficient resource utilization—and under what organizational conditions these technologies contribute meaningfully to sustainable innovation.

Future research could ultimately test the broader proposition emerging from this study: resource scarcity is not merely an antecedent barrier to sustainable innovation but a multidimensional condition whose effects depend on an organization's capacity to transform constraints into adaptive and innovative responses.

7. References

- Adams, R. D., Jeanrenaud, S., Bessant, J., Denyer, D., & Overy, P. (2016). Sustainability- oriented Innovation: A Systematic Review. *International Journal of Management Reviews*, 18(2), 180–205. <https://doi.org/10.1111/ijmr.12068>
- Afeltra, G., Alerasoul, S. A., & Strozzi, F. (2023). The evolution of sustainable innovation: from the past to the future. *European Journal of Innovation Management*, 26(2), 386–421. <https://doi.org/10.1108/ejim-02-2021-0113>
- Aka, K. G. (2019). Actor-network theory to understand, track and succeed in a sustainable innovation development process. *Journal of Cleaner Production*, 225, 524–540. <https://doi.org/10.1016/j.jclepro.2019.03.351>
- Albort-Morant, G., Leal-Millán, A. G., & Cepeda-Carrión, G. (2016). The antecedents of green innovation performance: A model of learning and capabilities. *Journal of Business Research*, 69(11), 4912–4917. <https://doi.org/10.1016/j.jbusres.2016.04.052>
- Aminpour, P., Gray, S. G., Richardson, R., Singer, A. B., Castro-Diaz, L., Schaefer, M., Ramlan, M. A., & Chikowore, N. R. (2020). Perspectives of scholars on the nature of sustainability: a survey study. *International Journal of Sustainability in Higher Education*, 21(1), 34–53. <https://doi.org/10.1108/ijshe-05-2019-0161>
- Anand, M., & Singh, J. (2021). Business students' perception of corporate social responsibility: an exploratory study. *DECISION*, 48(3), 261–284. <https://doi.org/10.1007/s40622-021-00284-8>
- Anggara, A. A., Aryoko, Y. P., Dewandaru, R. O., Kharismasyah, A. Y., & Fatchan, I. N. (2025). Does Maintaining Resources, Diversification, and Internationalization Matter for Achieving High Firm Performance? A Sustainable Competitiveness Strategy for China Taipei Firms. *Sustainability*, 17(4), 1576. <https://doi.org/10.3390/su17041576>
- Bansal, P. (2005). Evolving sustainably: a longitudinal study of corporate sustainable development. *Strategic Management Journal*, 26(3), 197–218. <https://doi.org/10.1002/smj.441>
- Bhattacharya, A., Good, V., & Sardashti, H. (2020). Doing good when times are bad: the impact of CSR on brands during recessions. *European Journal of Marketing*, 54(9), 2049–2077. <https://doi.org/10.1108/ejm-01-2019-0088>
- Brink, T. (2024). Future innovation Unleashed for sustainability in longitudinal research in micro-and small-sized enterprises. *Sustainability*, 16(13), 5547. <https://doi.org/10.3390/su16135547>
- Brundtland, G.H. (1987). Our common future—Call for action. *Environmental Conservation*, 14(4), pp.291-294.
- Bryman, A. (2016). *Social Research Methods*, New York: Oxford University Press, 4th ed.
- Choi, S. C., & Ng, A. (2011). Environmental and Economic Dimensions of Sustainability and Price Effects on Consumer Responses. *Journal of Business Ethics*, 104(2), 269–282. <https://doi.org/10.1007/s10551-011-0908-8>
- Cillo, V., Petruzzelli, A. M., Ardito, L., & Del Giudice, M. (2019). Understanding sustainable innovation: A systematic literature review. *Corporate Social Responsibility and Environmental Management*, 26(5), 1012–1025. <https://doi.org/10.1002/csr.1783>
- De Medeiros, J. F., Ribeiro, J. L. P., & Cortimiglia, M. N. (2014). Success factors for environmentally sustainable product innovation: a systematic literature review. *Journal of Cleaner Production*, 65, 76–86. <https://doi.org/10.1016/j.jclepro.2013.08.035>

- De Paoli, S. (2024). Performing an inductive thematic analysis of semi-structured interviews with a large language model: An exploration and provocation on the limits of the approach, *Social Science Computer Review*, 42(4), 997-1019.
- Easterby-Smith, M., Thorpe, R., Jackson, P. R., and Jaspersen, L. J. (2018). *Management and business research* (6th ed). London: Sage Publications.
- Etikan, I., Musa, S. A. and Alkassim, R. S. (2016). Comparison of convenience sampling and purposive sampling, *American Journal of Theoretical and Applied Statistics*, 5(1), 1-4.
- Evans, S., Vladimirova, D., Holgado, M., Van Fossen, K., Yang, M., Silva, E. A., & Barlow, C. Y. (2017). Business Model Innovation for Sustainability: Towards a Unified Perspective for Creation of Sustainable Business Models. *Business Strategy and the Environment*, 26(5), 597–608. <https://doi.org/10.1002/bse.1939>
- Foxon, T. J., & Pearson, P. J. G. (2008). Overcoming barriers to innovation and diffusion of cleaner technologies: some features of a sustainable innovation policy regime. *Journal of Cleaner Production*, 16(1), S148–S161. <https://doi.org/10.1016/j.jclepro.2007.10.011>
- Fu, Q., Sial, M. S., Arshad, M., Comite, U., Thu, P. A., & Popp, J. (2021). The Inter-Relationship between Innovation Capability and SME Performance: The Moderating Role of the External Environment. *Sustainability*, 13(16), 9132. <https://doi.org/10.3390/su13169132>
- Gebauer, H., Paiola, M., Saccani, N., & Rapaccini, M. (2021). Digital servitization: Crossing the perspectives of digitization and servitization. *Industrial Marketing Management*, 93, 382–388. <https://doi.org/10.1016/j.indmarman.2020.05.011>
- Golafshani, N. (2015). Understanding Reliability and Validity in Qualitative Research. *The Qualitative Report*, 8(4) 597-607. <https://doi.org/10.46743/2160-3715/2003.1870>
- Hargadon, A. (2015). *Sustainable Innovation: Build Your Company's Capacity to Change the World*. Stanford University Press.
- Hossain, M. (2021). The effect of the Covid-19 on sharing economy activities. *Journal of Cleaner Production*, 280, 124782. <https://doi.org/10.1016/j.jclepro.2020.124782>
- Hyde, K. F. (2000). Recognising deductive processes in qualitative research. *Qualitative Market Research: An International Journal*, 3(2), 82–90. <https://doi.org/10.1108/13522750010322089>
- Kadambala, D. K., Subramanian, N., Tiwari, M. K., Abdulrahman, M. D., & Liu, C. (2017). Closed loop supply chain networks: Designs for energy and time value efficiency. *International Journal of Production Economics*, 183, 382–393. <https://doi.org/10.1016/j.ijpe.2016.02.004>
- Kekkonen, A., Pesor, R., & Täks, M. (2023). Stepping towards the Green Transition: Challenges and Opportunities of Estonian Companies. *Sustainability*, 15(5), 4172. <https://doi.org/10.3390/su15054172>
- Keränen, O., Komulainen, H., Lehtimäki, T., & Ulkuniemi, P. (2021). Restructuring existing value networks to diffuse sustainable innovations in food packaging. *Industrial Marketing Management*, 93, 509–519. <https://doi.org/10.1016/j.indmarman.2020.10.011>
- Ketata, I., Sofka, W., & Grimpe, C. (2015). The role of internal capabilities and firms' environment for sustainable innovation: evidence for Germany. *R&D Management*, 45(1), 60–75. <https://doi.org/10.1111/radm.12052>
- Klewitz, J., & Hansen, E. G. (2014). Sustainability-oriented innovation of SMEs: a systematic review. *Journal of Cleaner Production*, 65, 57–75. <https://doi.org/10.1016/j.jclepro.2013.07.017>
- Knapik, M. T. (2006). The Qualitative Research Interview: Participants' Responsive Participation in Knowledge Making. *International Journal of Qualitative Methods*, 5(3), 77–93. <https://doi.org/10.1177/160940690600500308>
- Korstjens, I., and Moser, A. (2018). Series: Practical guidance to qualitative research. Part 4: Trustworthiness and publishing, *European Journal of General Practice*, 24(1), 120–124.
- Korten, D. C. (1998). When corporations rule the world. *European Business Review*, 98(1). <https://doi.org/10.1108/ebv.1998.05498aab.007>
- Kotler, P., & Lee, N. Y. (2005). Best of Breed: When it Comes to Gaining a Market Edge While Supporting a Social Cause, “Corporate Social Marketing” Leads the Pack. *Social Marketing Quarterly*, 11(3–4), 91–103. <https://doi.org/10.1080/15245000500414480>
- Le, U. M., & Liao, T. S. (2018). A Dynamic View of Global Integration and Local Responsiveness Framework. *International Journal of Emerging Research in Management and Technology*, 6(8), 58. <https://doi.org/10.23956/ijermt.v6i8.119>

- Lopes, J. T., Gomes, S., Pacheco, R., Monteiro, E., & De Rosália E Silva Santos, C. E. (2022). Drivers of Sustainable Innovation Strategies for Increased Competition among Companies. *Sustainability*, 14(9), 5471. <https://doi.org/10.3390/su14095471>
- Madanaguli, A., Dhir, A., Talwar, S., Clauß, T., Kraus, S., & Kaur, P. (2023). Diving into the uncertainties of open innovation: A systematic review of risks to uncover pertinent typologies and unexplored horizons. *Technovation*, 119, 102582. <https://doi.org/10.1016/j.technovation.2022.102582>
- Miles, M. B., & Huberman, A. M. (1994). *Qualitative Data Analysis: An Expanded Sourcebook*. SAGE.
- McIntosh, M. J., and Morse, J. M. (2015). Situating and constructing diversity in semi-structured interviews, *Global qualitative nursing research*, 2, 2333393615597674.
- Naeem, M., Ozuem, W., Howell, K., and Ranfagni, S. (2023). A step-by-step process of thematic analysis to develop a conceptual model in qualitative research, *International Journal of Qualitative Methods*, 22, 16094069231205789
- Nasiri, M., Saunila, M., Rantala, T., & Ukko, J. (2021). Sustainable innovation among small businesses: The role of digital orientation, the external environment, and company characteristics. *Sustainable Development*, 30(4), 703–712. <https://doi.org/10.1002/sd.2267>
- Nidumolu, R., Prahalad, C. K., & Rangaswami, M. R. (2015). Why sustainability is now the key driver of innovation. *IEEE Engineering Management Review*, 43(2), 85–91. <https://doi.org/10.1109/emr.2015.7123233>
- Park, E. (2019). Corporate social responsibility as a determinant of corporate reputation in the airline industry. *Journal of Retailing and Consumer Services*, 47, 215–221. <https://doi.org/10.1016/j.jretconser.2018.11.013>
- Petruzzelli, A. M., Dangelico, R. M., Rotolo, D., & Albino, V. (2011). Organizational factors and technological features in the development of green innovations: Evidence from patent analysis. *Innovation-management Policy & Practice*, 13(3), 291–310. <https://doi.org/10.5172/impp.2011.13.3.291>
- Placet, M., Anderson, R. T., & Fowler, K. M. (2005). Strategies for Sustainability. *Research-technology Management*, 48(5), 32–41. <https://doi.org/10.1080/08956308.2005.11657336>
- Pricopoaia, O., Lupaşcu, A., & Mihai, I. O. (2024). Implications of innovative strategies for sustainable entrepreneurship—solutions to combat climate change. *Sustainability*, 16(22), 9742. <https://doi.org/10.3390/su16229742>
- Roberts, S., & Tribe, J. (2008). Sustainability Indicators for Small Tourism Enterprises – An Exploratory Perspective. *Journal of Sustainable Tourism*, 16(5), 575–594. <https://doi.org/10.1080/09669580802159644>
- Ruichen Liu. (2023). Multi-Perspective Analysis of the Sustainable Transformation of Multinational Companies. *Journal of Progress in Engineering and Physical Science*, 2(2), 59–65. <https://doi.org/10.56397/JPEPS.2023.06.07>
- Runde, J. (1998). Clarifying Frank Knight’s discussion of the meaning of risk and uncertainty. *Cambridge Journal of Economics*, 22(5), 539–546. <https://doi.org/10.1093/cje/22.5.539>
- Sabatini, F. (2019). Culture as Fourth Pillar of Sustainable Development: Perspectives for Integration, Paradigms of Action. *European Journal of Sustainable Development*, 8(3), 31. <https://doi.org/10.14207/ejsd.2019.v8n3p31>
- Saunders, B., Kitzinger, J., and Kitzinger, C. (2014). Anonymising interview data: challenges and compromise in practice. *Qualitative Research*, 15(5), 616–632. <https://doi.org/10.1177/1468794114550439>
- Saunders, M., Lewis, P., & Thornhill, A. (2009). *Research Methods for Business Students*. Pearson Education.
- Seuring, S., & Gold, S. M. (2013). Sustainability management beyond corporate boundaries: from stakeholders to performance. *Journal of Cleaner Production*, 56, 1–6. <https://doi.org/10.1016/j.jclepro.2012.11.033>
- Singh, P. K., & Maheswaran, R. (2023). Analysis of social barriers to sustainable innovation and digitisation in supply chain. *Environment, Development and Sustainability*. <https://doi.org/10.1007/s10668-023-02931-9>
- Stebbins, R. A. (2001). *Exploratory research in the social sciences*, Sage Publications Ltd.
- Tseng, M. L., Chang, C. H., Lin, C. W. R., Wu, K. J., Chen, Q., Xia, L., & Xue, B. (2020). Future trends and guidance for the triple bottom line and sustainability: A data driven bibliometric analysis.

- Environmental Science and Pollution Research*, 27, 33543-33567.
<https://doi.org/10.1007/s11356-020-09284-0>
- Urbinati, A., Esfandabadi, Z. S., & Petruzzelli, A. M. (2023). Assessing the interplay between Open Innovation and Sustainability-Oriented Innovation: A systematic literature review and a research agenda. *Business Ethics, the Environment and Responsibility*, 32(3), 1078–1095.
<https://doi.org/10.1111/beer.12540>
- Walker, B. (2008). Small and medium enterprises and the environment: Barriers, drivers, innovation and best practice: A review of the literature. Research Online. <https://ro.ecu.edu.au/ecuworks/7062>
- Wang, J., Li, Y., Liu, X., & Du, Y. (2022). Enterprise characteristics and external influencing factors of sustainable innovation: Based on China's innovation survey. *Journal of Cleaner Production*, 372, 133461. <https://doi.org/10.1016/j.jclepro.2022.133461>
- Weidner, K., Nakata, C., & Zhu, Z. (2021). Sustainable innovation and the triple bottom-line: a market-based capabilities and stakeholder perspective. *The Journal of Marketing Theory and Practice*, 29(2), 141–161. <https://doi.org/10.1080/10696679.2020.1798253>
- Wilson, J. (2015). The triple bottom line. *International Journal of Retail & Distribution Management*, 43(4/5), 432–447. <https://doi.org/10.1108/ijrdm-11-2013-0210>
- Wu, L., & Jin, S. (2022). Corporate Social Responsibility and Sustainability: From a Corporate Governance Perspective. *Sustainability*, 14(22), 15457. <https://doi.org/10.3390/su142215457>
- Wu, K. J., Zhu, Y., Tseng, M. L., Lim, M. K., & Xue, B. (2018). Developing a hierarchical structure of the co-benefits of the triple bottom line under uncertainty. *Journal of Cleaner Production*, 195, 908–918. <https://doi.org/10.1016/j.jclepro.2018.05.264>
- Yin, R. K. (2013). Validity and generalization in future case study evaluations. *Evaluation*, 19(3), 321–332. <https://doi.org/10.1177/1356389013497081>
- Zhao, X., Hlaing, N. M., Shen, H., Xiao, P., & Adugna, T. S. (2025). The Role of Sustainable Business Environment in Shaping Entrepreneurs' Performance: Evidence from Myanmar. *Sustainability*, 17(2), 568. <https://doi.org/10.3390/su17020568>