ACCELERATING SUSTAINABILITY GOALS THROUGH DIGITALIZATION

How the consumer industry maximizes their SDG through digitalization

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ABSTRACT

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Title: Accelerating sustainability goals through digitalization
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Research questions: How does sustainability efforts of corporations get accelerated by the aid of digitalization?
Purpose: The purpose of this paper is to understand how supermarkets are able to meet their sustainability goals and accelerate them through digitized efforts.
Method: Qualitative research through case studies and primary data collected with interviews.
Conclusion: It can be concluded that sustainability efforts get accelerated with the aid of digitalization. The participants of the interview showed on numerous levels that digitalization goes hand in hand with sustainability and helps expedite these efforts. The model brought forward by the authors seems to be rather relevant, additionally, it explains the phenomena concrete and accurately.
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1 Introduction

In the upcoming decades' sustainability is only getting more present in the day-to-day operations of businesses. Governments around the world have been discussing stricter regulations to reach the emission deadlines and SDGs by implementing fines (Niestroy et al., 2019). In the most recent years, we see corporations from all industries reaching digitalization to further improve their efforts surrounding digitalization. A prime example of sustainability going hand in hand with digitalization in the retail industry is the Belgian conglomerate Colruyt Group implementing electronic price tags which increased efficiency and reduced 90 tons of paper usage per year (Laska, 2021).

1.1 Background

As a concept, sustainability is broad and portrays endless paths for potential explorations. The concept is widely used by corporations, organizations, and other entities, it can be assumed that its basic characteristics are common knowledge as well as important. The fundamental characteristics of sustainability are seen as the; Triple Bottom Line (TBL) which consists of three dimensions: economic, social, and environmental (Elkington & Rowlands, 1999). By contributing to each of the stated dimensions a sustainable equilibrium will be reached resulting in limiting the exploitation of non-renewable resources. Although sustainability is also seen as thriving towards the ultimate technology and products that harm the environment in no way, it is vital to remember that this is relative due to the ever-evolving nature of humanity, corporations, and technology.

In an uncomplicated manner to introduce the concept of sustainability within an organization, recommendations in the form of goals have been implemented by the United Nations which are the Sustainable Development Goals (SDGs). Consisting of 17 goals and 169 targets built from the sustainable model (TBL) with the goal of transforming our world towards individual equality initiatives until 2030 (United Nations, 2015). Although all goals are vital, the authors of this paper found it appropriate to narrow down the subject of sustainability to ensure a high level of focus and improve the results. Therefore, this paper will utilize SDG goal 8 and part of target 8.2 to grasp the efforts and differences the retail industry focuses upon, in the field of sustainability in combination with digitalization. The chosen goal's objective is to increase sustainable economic growth by targeting technological improvement and innovative endorsement (United Nations, 2015).
As for the sustainability efforts within the consumer industry, a variety of peripheral matters influence the exertion a business puts in. At the same time, it is also highly connected and intertwined with consumer-based demand (Ehgartner, 2018). This means that a consumer’s understanding of sustainability will increase its demand for sustainable products, affecting a store’s inventory to meet the consumer demand. Meaning that consumers are deciding the degree of a market's effort toward the TBL. On the other hand, the author notes that there are consumers which prefer the industry to take the lead in choosing their own products. This can cause a moment of loss and confusion on both sides. Warde (2005) suggests that consumption often occurs autonomously by the average consumer and without the proper state of mind and thought processes to make well-informed decisions. Consequently, this can lead to unlawful conduct resulting in greenwashing or other unethical behaviors from an entity within the consumer industry. Greenwashing is the term used for explaining that corporations have disingenuous environmental actions which mislead consumers and other corporations (Delmas & Burbano, 2011).

To broaden the perspective on companies' efforts for sustainability, it is crucial to also dive into the opportunities of digitalization. Which is the incorporation of digital technologies into business/social processes, to improve them. Supermarket retailing has seen significant growth in digitization efforts both for customer convenience and efficiency (Piroth et al., 2020). According to Wang & Sarkis (2021), technological advances such as artificial intelligence (AI), machine learning, IoT, 5G, blockchain-distributed ledger technology, pervasive computing, data analytics, and immersive technology are developing at an unprecedented rate. These advances are transforming and disrupting the status quo of the freight transport and logistics sector.

Although traditionally companies look towards digitalization for efficiency improvements, it is also being used as an accelerator toward a more sustainable economy. Digitalization enables more efficient processes in companies, helps minimize waste, promotes longer life for products, and minimizes transaction costs (Antikainen et al., 2018). Although digitalization can also have an initial negative impact on the environment, with sustainment, digitalization and its design can strengthen the ability to respond to the challenges of living on a finite planet (van der Velden, 2018).
Moreover, acceleration is the concept of positively speeding up (Oxford Reference, 2022). Therefore, the concept will be used as a way to increase the amount of speed it takes from decision to completion. Technologies already have a major impact on both businesses and consumers on a daily basis, however, their possibilities to positively accelerate the sustainability efforts in the retailing industry are rather abstract and unknown.

1.2 Problematization

The world is in constant development, businesses need to constantly adapt through internal innovations and technology that advances the business toward sustainable goals. However, shifting the business model towards technological and sustainable elements can put the company at risk (Dragos et al., 2020). Hence, careful implementation and practical judgments could ease uncertainties and prevent integrational problems. Therefore, it is crucial to have a consistent policy and governance of technological innovations to enhance the knowledge to achieve technological growth and innovation practitioners, as it is seen as a central component for the sustainable development engagements (Del Rio Castro et al., 2021). Denicolai et al., (2021) mean that sustainability is a way for firms to grow. Even though this enables an entity to develop, Denicolai et al., (2021) further explain it cannot occur through exploiting the planet’s resources. The exploitation could lead to catastrophic environmental damage threatening both our existence and the continuation of the planet. Therefore the concept of sustainability is crucial to recognize and beseech since without reinvestments into renewable and durable resources it will result in exploiting and limiting future generations’ capability to maximize their freedom.

Dragos et al., (2020) in addition mean that recognizing technological trends is essential since it is a way to force businesses to act and increase their agile works with the implementation of innovative models that are driven by technological solutions. It is therefore important to recognize digitalization as a global economic phenomenon since it prepares and influences organizations for the present-day digitized age (United Nations, 2015; Antikainen et al., 2018; Dragos et al., 2020). This recognizes that technology is a key driver of innovation, and key to future developments. Innovative investments develop sustainable businesses (Dragos et al., 2020).
Numerous studies on technology, digitalization as well as sustainability have been conducted focusing on their effect on each other (Dragos et al., 2020; Ghobakhloo, 2020; Bjørlo et al., 2021; Denicolai et al., 2021; Jayashree et al., 2021; Gupta & Rhyner, 2022). The implementation of digitalization and its utilization in consumer stores has been discussed and examined (Mariani et al., 2020; Habib & Hamadneh, 2021; Piroth et al., 2020). While a connection between digitization and sustainability has been studied in previous literature and research, its effect on sustainable acceleration through digitalization within the supermarket industry has not yet been studied thoroughly. Previous research suggests a gap between sustainability and digitization (Del Rio Castro et al., 2021; Gupta & Rhyner, 2022; Jayashree et al., 2021). The author's investigations have shown that the subject of Sustainable Development Goals (SDGs) and their effects together with digitalization is not extensive enough, and mainly their possible collective engagements. Therefore, the subject shows the possibility for an exploration between technology, digitalization, and sustainability engagements in the supermarket industry.

1.3 Research question:

*How does sustainability efforts of corporations get accelerated by the aid of digitalization?*

1.4 Purpose

The purpose of this study is to understand how supermarkets within the consumer industry are able to meet their sustainability goals and accelerate them through digitized efforts through a qualitative study consisting of a variety of in-depth interviews with experts in the subjects at hand and sustainability reports from the respectable supermarkets in Sweden. The subject of sustainability in consumer stores has been discussed rather intensely by the academic community (Bjørlo & Pasquine, 2021; Laska, 2021; Mariani & Fosso Wamba, 2020; Piroth et al., 2020). However, studies between sustainability, digitalization, and their impacts on the supermarket industry are less explored. Hence, this study can lay the foundation for a more sustainable and circular economy in the consumer industry to prevent consumption from negatively impacting TBL. Thus, the concept of digitalization as an aid for companies to accelerate their digital effort can be of a rather significant value for both the managers of these stores, the environment regarding reducing pollution, as well as future researchers to elaborate on this phenomenon.
2 Literature review

This section presents literature relevant to sustainability and digitalization. It tries to take an objective view by displaying both the perks and disadvantages of the concepts. Furthermore, it presents the conceptual framework model which connects sustainability efforts together with digitalization to accelerate sustainability goals.

2.1 Sustainability

Sustainability consists of endless opportunities, directions as well as dimensions. Moreover, it represents the unwritten rule to prevent early earth over-shooting due to exploitation of non-renewable resources. Jayashree et al., (2021) mean that the concept of sustainability development indicates not compromising future generations' ability to obtain non-renewable resources. Restrictions, legislations, and limitations have to be considered in order to prevent environmental damage, as the awareness of the exploitation of non-renewable resources has increased during the last decades.

2.2 Triple bottom-line

From a sustainable point of view, it is crucial to consider the negative climatic impact and its collateral and long-lasting damages. Jayashree (2021) suggests that the triple-bottom-line (TBL) urges a shift from the stakeholder’s profit-making view, economical as well as their limited liability which needs to be changed and excluded to reach its sustainable equilibrium.

The concept of (TBL) consists of three dimensions; economic, social, and environmental (Elkington & Rowlands, 1999; Jayashree et al., 2021). Economical sustainability aims for the actual profit achievement, social provides the understanding of mankind's as well as the society's ability to advance, and the environment prevents exploitation of natural resources (Jayashree et al., 2021). Even though TBL represents a suitable and sustainable framework critics such as Alhaddi (2015) mean that TBL is mainly used as a substitute for sustainability and not its actual framework. Montabon et al., (2016) mean that the triple-bottom-line still encourages organizations to use its framework in generating new knowledge and technologies. In order for organizations to succeed with sustainability efforts, drastic changes towards TBL need to be done, as well as understand their bottom line (Elkington & Rowlands, 1999).
Understanding TBL and its fundamental principles from a greater perspective lay the foundation to enhance the understanding of sustainable principles. The knowledge is to be used to understand how each of the dimensions works in practice. A company’s TBL is often calculated through self-assessment by accountants summarizing records and analyzing collected quantitative data, resulting in the output in relation to environmental and social aspects. Yet, it lacks a clear organizational corporate accountability for each component (Elkington, 1998; Elkington & Rowlands, 1999). TBL is the concept of making all the dimensions work and executing them, with each of the dimensions built upon sub-chapters such as its own capital, accountability, accounting, issues, and indicators, auditing as well as reporting its risk rating (Elkington, 1998).

2.2.2 Economy

To understand the economic dimension, it should be prioritized by moving forward from the traditional economic theories. Meaning that the established theories are only considered in two forms of production outcome, such as the physical capital and the financial capital. Technological knowledge needs to be taken into consideration, as intangible assets (human capital). The intangible asset in this sense is measured on its tacit knowledge (experience, skills, and knowledge-based assets). (Elkington, 1998; Elkington & Rowlands, 1999)

Bottom lines are adapted after institutions and societies in which they have been created. It is therefore questionable to pinpoint the exact meaning behind the economical aspect. The economic bottom lines’ principles answer which type of long-term sustainability measures should be applied, predict its future value but also future use. This suggests that the pinpoint needs to be assessed in its context and adapted after its external, and internal circumstances as well as incorporate economical models into its environment. (Elkington, 1998; Elkington & Rowlands, 1999)

One of the key factors reflecting upon the economical dimension means that it wants to understand companies' advancement towards eco-efficiency in its sustainable economic development engagements. This is mainly explained in companies' sustainability reports. Even though the reports should be transparent, Elkington and Rowlands (1999) explain the risk that some aspects might be shadowed.
2.2.3 Environmental

As previously mentioned Denicolai et al., (2021) mean that exploiting the planet’s resources will help companies to grow but will result in environmental damages. Predicting the cost is crucial and the impact exploitations might have. As suggested by Alvarex et al., (2017) the environmental dimension aims to prevent environmental destruction with the aid of sustainable operations. This is also strengthened by Elkington and Rowlands (1999) statement that explains that business people prefer environmental challenges over social. They further explain that environmental functions such as overlooking greenhouse gasses, water, and exploitations should be considered in the calculation of environmental sustainability. Elkington (1998) explains that a product’s life-cycle should be taken into consideration, such as energy waste, material, and risk of pollution. This refers to the ecological footprint and its potential effect on the environment.

2.2.4 Social

Socially sustainable efforts reflect on the environmental aspect, culture, and engagements of the employees. The social aspect looks at workers’ safety, health, comfort, and risk prevention, which enhances the quality of life and health (Elkington, 1998; Alvarex et al., 2017). The social aspect looks toward developing trustworthiness and decreases the risk for employee harm as well as other uncertainty prevention measurements.

2.3 Environmental, social, and corporate governance

Environmental, social, and corporate governance (ESG) reporting increases a company's legitimacy internally but also toward the external stakeholders, this results in a potential increase in citizens’ trust in the business (Camilleri, 2017). ESG is, therefore a crucial instrument to increase potential profits and meet sustainable development goals. The legal framework from the United Nations means that the intention is to enhance investments that take environmental, social, and governance issues into account (Environment Programme Finance Initiative, 2005; Camilleri, 2017). The framework also raises ESG matters that are defined with five broad areas addressing each concern. Problems are defined as modified organisms, corporate governance, environmental pollution, emissions, and labor issues. Sharma et al., (2020) explain that the most significant variable that organizations often share is transparency with its economical gain. This explains that the more profitable a company is, the higher the disclosure of ESG factors, it also relates to the size of the company, where larger
firms disclose way more than smaller. Thus making ESG an economical-profitability variable in the framework for sustainability. This is connected with an organization's choice of strategies where Pan et al., (2022) suggest that developing a sustainable intelligence solution would enhance understanding of the goals due to visualization, tracks, and benchmarks connected to the sustainability targets. This could increase productivity towards economic growth, and innovative engagements as well as contribute to fair employment.

2.4 Sustainable Development Goals - 8.0 & 8.2

At the end of September 2015, the United Nations introduced the Sustainable Development Goals. These consist of 17 goals and 169 targets built upon the sustainable model (TBL) with the goal of transforming our world towards individual equality initiatives until 2030. To promote economic growth with the aspect of social sustainability, goal 8.0 was introduced. One of its sub-goals 8.2 aims to promote technological and innovative explorations to enhance economic productivity. (United Nations, 2015)

As technology is in constant improvement due to the free market, the development shows the importance of innovative technologies that give the possibility for a transformative tackling of the SDGs as well as contribute to the increased effect of the implementation of the goals (Pan and Zhang, 2020; Schwindenhammer, & Gonglach, D. 2021). Schwindenhammer and Gonglach (2021) mean that accelerating the achievement of the SDGs is to organize the technological investments from a bottom-up solution, but will not be the only means to ensure the implementation. It also points to a similar suggestion as (Elkington, 1998; Elkington & Rowlands, 1999) that the context of sustainability depends on its environment. Hence, understanding the underlying means between a wide range of sectors such as jurisdictions and technology innovations at different governance levels (global, national, and local), in return, it will pinpoint a more concrete and complex SDG implementation that needs to be aligned with the governance levels while not losing the public's interest (Schwindenhammer & Gonglach, 2021). Therefore increasing the economic productivity such as the SDG sub-goal 8.2, could be done through technological developments enhancing already existing ones in use. Specifically, the Internet of Things (IoT) or also called industry 4.0, Big data, and artificial intelligence (AI) (Queiroz et al., 2019). Thus, affects SDG 8.0 in promoting economically sustainable growth. However, key stakeholders need to participate in response to the global sustainability challenges in order to emerge innovative technology exploration (Schwindenhammer &
Gonglach, 2021). This implies the usage of SDG 8.0 and 8.2 combine sustainability while enhancing the use of technological solutions and the underlying factor of innovation engagements.

2.5 Digitalization

Where the 20th century focused on bulk operations and efficiency, the 21st century seems to focus on digitalization and optimization. Where young businesses have embraced this new revolution, traditional companies tend to struggle and not fully grasp the opportunities of this wave. According to Antikainen et al. (2018), digitalization is a vital pillar in the efforts toward a more sustainable circular economy. Digitalization at its core is the use of digital technologies to transform and improve a business and its improvement can be interpreted as both more efficient and less costly than the traditional or previous approaches (Denicolai et al., 2021).

However, digitalization is not only focusing on these emerging technologies that improve efficiency, it is also largely about the companies' capability to implement these digital technologies. Due to for both multinational enterprises (MNEs) and small-medium enterprises (SMEs) many external factors decide the competence and efficiency of applying digital technologies. While the new wave of technology is now often used as an accelerator toward higher efficiency, it can also be used as a booster in companies' activities toward sustainability activities.

2.6 Sustainable Digitalization

The combination of digitalization and sustainability is a rather new phenomenon, nevertheless, it is an important enabler in the efforts of businesses worldwide towards the SDGs. Where traditionally digitalization is used for improvements in efficiency and profit margins, digitalization also facilitates opportunities to use resources more efficiently and decrease emissions on a wide-scale level (Antikainen et al., 2018). However, an important factor to keep in mind is the actual sustainability of these digitalization technologies. Previous research (Elkington & Rowlands, 1999) has shown that although digitalization causes businesses to reduce their environmental footprint personally, the actual technology has also an impact on the environment that is often neglected by businesses. A clear example of this is the mobile phone, although the invention has avoided certain emissions and use of resources, the production is still rather extensive and inefficient in recycling processes (van der Velden, 2018). Finally, sustainable digitalization offers the opportunity to tailor products with for
example RFID (Radio-frequency identification) technology towards customer needs which are ever-transforming towards durability and responsibility (Antikainen et al., 2018). Hence, digitalization gives a competitive advantage for sustainable business development (Dragos et al., 2020).

2.7 Industry 4.0

The initial industrial revolution around the end of the 18th century reshaped the complete order of life and the possibilities the average western inhabitant had. Since then two more revolutions and humanity are on the brink/ beginning days of the fourth industrial revolution that will presumably reshape lives once more. Where the first revolution focused on new manufacturing processes, Industry 4.0 heavily relies on the Internet of Things (IoT) and digital transformations. At its core, this revolution can be explained as the digitalization and smartization of factories, distribution channels, and value chain members. As with any emerging invention, it is rather complex to explain what exactly falls underneath the initial term Industry 4.0. However, often following technologies are included and understood by scholars as to the foundation of this IoT: Smart Applications, Augmented and Virtual Reality, Big Data Analytics, cloud computing, everyday object digitalization, and artificial intelligence to just name a few (Ghobakhloo, 2020). This rapid emergence of technology has led to a digital disruption that offers opportunities and challenges in all industries, but in particular, the supply chain is broadly seen as a prime example. In order for businesses to understand the complexity and opportunity of this transformation, significant resources and capabilities are required to increase automation between the steps in the supply chain through smart applications. Further transforming it into a digital supply chain optimized for intelligent autonomy (Queiroz et al., 2019).

2.7.1 Artificial Intelligence

The subject that undoubtedly has been discussed most prominently in the industry of digitalization is Artificial Intelligence (AI). Although the opportunities are endless, the possible repercussions are just as boundless. In the present situation, AI-based decision aides are widely adopted by companies in the consumer industry. These can vary widely in form and usability, but the most common approaches are personalized content suggestions, decision-making aids, and relevant data analytics. Often these are unknown by the broad public, however, they are broadly perceived as benefiting both consumers and corporations (Bjørlo et al., 2021). When
focusing and narrowing down to the supermarket industry, these advanced technologies are based on the logistics areas and supply chain activities (Habib & Hamadneh, 2021). A prime example as earlier mentioned is the smart price tags used by a Belgian supermarket (Laska, 2021). However, a vital aspect to keep in mind in the introduction and adaptation of AI-related technologies in consumer-related industries is the acceptance of the consumers. According to Habib and Hamadneh (2021), this is a thin line that is rather delicate to define and businesses tend to be on the cautious side in their AI implementations. Recently due to the Covid-19 pandemic, supermarkets had to provide improved/additional online shopping opportunities. Here AI-based decision aids were installed, and although it yielded an overall business positive net result, a small portion of consumers got a negative outcome from this personalized recommendation software (Bjørlo et al., 2021).

2.7.2 Big Data

Big Data Analytics (BDA) is more unknown to the broad public, nevertheless, it has a large impact on the day-to-day business activities of the average MNEs. This form of analytics is based on the 5 V’s framework consisting of Volume (size of data), Variety (different formats/structures), Velocity (speed of generation), Value (Process of extracting the data), and Veracity (governance of reliability) (Fosso Wamba et al., 2015). What Big Data exactly is, varies broadly but at its core, it is enormous databases that can be analyzed by e.g AI, for relevant information and patterns. These are interpreted and create actionable insights and establish a competitive advantage for the business. As summarized by Mariani & Fosso Wamba (2020) The use cases vary throughout businesses but they have been used for improving efficiency throughout organizations, identifying ideal consumers profiles (ICP), optimizing digitization processes, and more. In the supermarket industry, in particular, this form of analytics can be applied on numerous occasions, but a prime example is to avoid and reduce food waste through appropriate marketing strategies and augmented learning from the data. These big data usages have been shown to accelerate sustainability efforts, and improve efficiency in the average supermarket. Besides that, rather experimenting with usage could be calculating risks, leveraging technologies, and understanding patterns in supply chains (de Souza et al., 2021).
2.8 Acceleration

Acceleration is and will be used according to Oxford Reference (2022) which suggests the meaning behind the word is speeding up, which could both be negative and positive. Hence, the word will be interpreted as the velocity of time occurring from the decision of a sustainable goal to action.
3 Conceptual Framework

Within this piece of the paper, the researchers explain and construct a framework that advises how sustainability efforts accelerate with the help of digitalization to reach the sustainability goals. As earlier presented sustainability consists of a vast variety of concepts and as explained it depends on its institution or society of creation (Elkington, 1998). It is therefore vital to understand how it should be used and what goals to set in order to reach targeted SDGs. Therefore, the ESG can be seen as the next step from TBL. ESG takes the next step in corporate sustainability toward stakeholders’ legitimacy as it takes environmental, social, and governance issues into account (Camilleri, 2017). However, TBL still lays the foundation for sustainable principles and should be considered, as it encourages organizations to sustainability efforts (Elkington & Rowlands, 1999). Earlier studies (Dragos et al., 2020; Gobakhollo, 2020; Bjørlo et al., 2021; Denicolai et al., 2021; Jayashree et al., 2021; Gupta & Rhyner, 2022) have shown that digitalization does have an effect on sustainability, but not with the aim to accelerate sat goals in consideration with the SDGs 8.0 and 8.2.

To obtain the sustainability targets Pan et al., (2022) suggest a digital intelligence with a clear visualization of the targets. Therefore sustainable digital transformation is to be considered due to its emerging advantages (Dragos et al., 2020). AI-based decision-making aids and relevant data analytics improve corporations' abilities to meet the needs of its user (Bjørlo et al., 2021). AI can be used as a tool to comprehend the vast amount of data collected, such as using the technology during BDA sourcing. BDA and AI are used for organizational improvements (Mariani & Fosso Wamba, 2020; Bjørlo et al., 2021). Even though the literature states technological advancements toward sustainability as an aid, it still lacks a framework for acceleration. Therefore, [Figure 1]. is introduced.
3.1 Acceleration towards sustainable goals model and its practices

The Acceleration towards sustainable goals model [Figure 1] tries to lay a foundation and explain the fundamental movement as sustainability importance grows within the organization. As sustainable rules and regulations are introduced the following step is to analyze them through digital means, in order to finalize and reach the sustainable goals.

3.1.1 Sustainability efforts

This part suggests the model [Figure 1] combination of sustainable engagements such as the TBL, ESG, and SDG which are aligned with the overall organizational efforts and goals. The model suggests focusing from left to right, by implementing TBL prior to ESG and SDGs are to be recommended, due to TBL lays the fundamental sustainable foundation. To strengthen the foundation and increase legitimacy towards external stakeholders the ESG model is introduced. ESG seems to be more of an ethical framework focusing on defining key problems. This model defines a problematization that should be aligned and targeted toward sat SDGs.
Thus, making ESG the actual core of understanding what needs to be done with the aid of fundamental theories and the SDGs. Taking all of this into consideration defines the sustainability efforts.

3.1.2 Digitalization

As the sustainable effort has been defined, the digitized implementation in [Figure 1] needs to be taken into consideration. As the everyday object gets technologically more advanced and society enters Industry 4.0, IoT is a criterion that needs to be an aid toward greater control of the sustainable effort. Thus making IoT a complement and connection of all applications to increase technological communication which increases effectiveness through data collection. The data itself will be collected as BDA in big databases. This dataset can be visualized and interpreted with the introduction of AI and its dashboards. Therefore AI will be used as a tool to increase productivity based on the prior data collection.

3.1.3 Acceleration

Acceleration is seen as three arrows pointing towards the sustainability goal on the model [Figure 1] when sustainability and digitalization meet. This suggests that the defined sustainable efforts with the aid of digitalization occur in the acceleration-equilibrium, which will allow faster aid to achieve the goals and objects related to the sustainable goals.

3.1.4 Sustainability goals

The sustainability goals are metrics on [Figure 1] that are defined by each individual organization and adapted after where it has been generated. Hence, (Elkington, 1998; Elkington & Rowlands, 1999) means that it needs to be assessed in its context and adapted after circumstances.
4 Method

This section presents the philosophy of the authors. It tries to give a clear view of assumptions in regards to increased credibility as well as the consistent quality of the research. This part also presents data collection, and explains how the interviews were conducted. Finally, presenting the choice of data analysis followed by ethics and criticism.

4.1 Research Philosophy

The proper philosophy is crucial for developing new knowledge and maintaining the appropriate mindset to research the defined topic. A research philosophy itself is made up of the authors’ previous assumptions, different perspectives, and research beliefs. In order to further ensure that this research is credible, reflexivity is key for the undertaking of the research (Saunders et al., 2019). The philosophical positioning of the paper will be interpretivism which will link appropriately with the assumptions and paradigm. This brings the focus to the research paradigm chosen for this paper, due to the impact sustainability efforts have on the planet, the sociology of radical change seemed fitting and rather the only choice.

Furthermore, the research philosophy will explain the earlier stated assumptions and philosophy in greater detail.

4.1.1 Assumptions

For a research paper discussing relevant topics with an impact on society, it is obvious that the authors have predisposed assumptions. Two concrete forms of assumptions are present throughout the research. Firstly ontology, which is the type of assumptions about the overall understanding of activities and the nature of the reality (Ding & Foo, 2002). These beliefs shaped and inspired the research and the understanding of the subjects (Saunders et al., 2019). On the other hand, epistemology, which is what is seen as authentic knowledge and shared between individuals offers the connection between scholars and research (Burrell & Morgan, 2017). The combination of the more abstract ontology with epistemology formed well based assumptions (Saunders et al., 2019).

4.1.2 Positioning

To position the philosophy of the paper, interpretivism was found to most conform to the authors’ approach. This approach focuses on the enactment of human behavior surrounding the
research of a wide variety of phenomena to comprehend the subjective meaning (Bell et al., 2019). Interpretivist research is bound to explore the intricacy of social phenomena and interpret these for further understanding (Collis & Hussey, 2013).

Besides that, this positioning aligns nicely and allows the authors to optimally analyze the qualitative research approach at hand by the authors. And on a final note, with the focus on observable data, the goal is to discover patterns and phenomena from the in-depth investigations. Which later on can be utilized in more practical situations and contexts (Saunders et al., 2019).

4.2 Research Approach

To approach researching the question surrounding this paper, induction will be applied. The inductive approach aligns with the interpretivism at hand, and concentrates on collecting qualitative data that later will be used to form a conceptual framework based on the results at hand (Bell et al., 2019). According to Saunders (2015), this theory gives the authors the opportunity to generate a theory relevant to the research question at hand by using subjective interpretations.

The authors commenced this study by initially understanding the subject at hand by taking a deep dive into the matter to gain an in-depth understanding of the preconceived knowledge. From this point, a research question was formed on the basis of compatible literature. Which later on formed the literature review and conceptual model to grasp and answer the question (Bitektine, 2007). To get comprehensive results that supported the dilemma of this research, a case study was executed in different fields. The case study approach is especially useful as it allows the researchers to understand a changing process within its real-life setting (Saunders et al., 2019). On one aspect, various interviews were made with both employees of the said companies and external experts on the major subjects at hand, which are combined with financial data and efforts from relevant businesses. This data is valuable and easily translatable later in the analysis (Saunders et al., 2019). Finally, the researchers then focus on comparing this information with the conceptual model to understand if it is proven or rejected. Alternatively, it could be necessary to slightly alter the model and match the findings from the data (Yin, 2018).
4.3 Research Design

To successfully research a topic in an organized way, a proper research design is vital. It gives the researchers clear objectives and a guideline to work from throughout the paper (Saunders et al., 2019). For this paper, a qualitative research design has been opted for. The qualitative method focuses on using non-numerical data as a collection technique and data analysis procedure. However in this occasion that is on the narrow side, due to secondary data being used that includes valuable numerical data which will help form an in-depth conclusion (Maxwell, 2022). To succeed in qualitative research, the strategy opted for is the case study research. This in-depth inquiry into the designated phenomenon will allow the authors to understand the practical dynamics of various corporations. Ideally, this will aid in not only understanding the model, but grasping empirical descriptions (Saunders et al., 2019). The rationale of this study can be summarized as explorative and descriptive due to the nature of the subject (Saunders et al., 2019).

Overall, the research design's intentions are to offer a structure where the writers can construct meanings about the phenomenon in question. The goal is to improve the judgment throughout the paper and ensure conceivable and practicable concepts amid the paper (Saunders et al., 2019).

4.4 Data Collection

To assess the conceptual model and the research question, a wide variety of data is necessary to give credibility to the paper and the hypotheses (Saunders et al., 2019). The data collection itself is obtaining and evaluating information in an organized method. Which aids in responding to the specific question and interpreting results (Sapsford & Jupp, 2006). This essential information was retrieved through a combination of both primary and secondary data.

Where secondary data initially helped significantly in the introduction of the subject and preparation. Later on, the yearly sustainability reports of the major Swedish supermarkets aided in understanding and analyzing the actual efforts.

However, primary data was invaluable throughout the paper and gave the paper a more in-depth dimension and credibility. From the start, it was used to form the complete literature review based on relevant peer-reviewed research articles. Finally, interviews are the foundation of our findings and are invaluable in the overall analysis and conclusion.
4.4.1 Primary Data Collection

Because this thesis is an interpretative study with the aim to understand the impact of digitalization in sustainability efforts in the Swedish supermarkets, interviews are of the highest vitality to improve credibility. This to form an extensive overview of the variety of business approaches, opportunities and challenges (Saunders et al., 2019). For the contact with these companies, LinkedIn, email and phone conversations were the main method of finding the different interviewees. In this initial contact the aim was to find employees heavily involved in either sustainability or digitalization on the management level or consultancy basis. Throughout the research, the author’s reached out to 113 individuals working in 13 different businesses. Of these people, 24 responded and seven individuals accepted the invitation to share their insights. From these seven people, around half worked at the supermarkets in Sweden, however a select group of sustainability consultancy experts as well as technological/digitalization experts were also contacted for an external understanding. Further on the purpose for this research was introduced in combination with future benefit’s for their respective corporations.

After receiving confirmation for the interest in contribution, a formal invitation was sent for a semi-structured interview lasting between 30-50 minutes. The aim was to interview employees from the most prominent supermarkets in Sweden to ensure an extensive overview, and avoid biased or limited results (Saunders et al., 2019). The vast majority of interviews were conducted through the internet program Zoom due to the convenience for both parties and the possibilities for recording. However, a small portion was also done in a respective store due to the relevance of showing their digitization efforts. Each interview took between 30-50 minutes, which was influenced by the interviewees information, and level of details. On some occasions various questions were answered at once.

For the questions, the author’s focused on questions that would engage the interviewees and explain more than just the company's policy. In total, 12 questions were put in place with first an introductory chapter and then the focus on both sustainability and digitalization. This to make sure there is an appropriate time scope for each subject. The researchers crafted these questions based on the previously found information in the literature review and focused on creating questions that are intertwined with the subjects at hand. First focusing on sustainability, which would make the interviewees comfortable and able to share their opinions besides the companies standard information. With the digitalization aspect, the author’s choose
more detailed and technical questions to get valuable insights that could set this paper apart. Appendix A shows an overview of the questions that were the baseline for each interview. However the author’s were free at times to add an extra question that would benefit the flow and the information the interviewee would share.

To ensure that no information got lost along the way, permission to record the interviews was asked at the beginning. The interviewees granted this permission on each occasion. Which accelerated transcription in an accurate way and ensured the data's validity. The majority of interviews were conducted in English to avoid misunderstanding in the interpretation of the data and minimize translation errors (Saunders et al., 2019). A minority was however executed in Swedish due to a higher comfort for the participant.

4.4.2 Secondary Data collection

The information found through secondary data deepens the research and enhances the research quality on an overall level (Saunders et al., 2019). This aided concretely with inspiring the researchers of choosing this topic and finding actual efforts of a variety of corporations in the sector.

On the other hand, it also increased the credibility of the information given in the interviews. All the major Swedish supermarkets post a yearly sustainability report. These documents explain in detail the full efforts these businesses make on a yearly basis. Although the major focus lies on sustainability, digitalization is often brought up. All this secondary data was obtained from their verified websites, and is part of public information. This to ensure the trustworthiness and reliability of these secondary findings (Saunders et al., 2019).

4.5 Data Analysis

To validate the case study, it is crucial to analyze the collected data at hand with the conceptual model and the concepts brought up in the literature review. Due to the sheer amount of information collected, it is vital to analyze it in an organized way (Saunders et al., 2019). For every analysis there are different techniques available and suited. This specific research seems most viable with the thematic analysis. Due to it offers the possibility to clearly dissect patterns and themes relevant to the research question (Bell et al., 2019).

To start off, the interviews and reports get transcribed. The purpose of this is to understand and sort the data from the various data sources. The focus was on finding similarities in words,
data, sentences and code these specific pieces of information. A prime example of this was the visible similarities in interviews regarding the use of digitalization in the supply chain to increase efficiency and reduce emissions. Through the digital possibilities, the authors had all the interviews open at one time to read each question of the interviews together which made the coding more homogenous and comprehensive. Marking of these similarities was done on the files, and an extra document was crafted to organize this extensive information source. These were later on analyzed and merged into themes with similar patterns or relationships. Understandably, the fixation lies on identifying patterns and themes heavily related to the research question. The themes are intertwined with each other to aid analyzing the subject more deeply (Bell et al., 2019). For this paper in particular, the practical approach seemed most suitable. The relevant information was coded and the focus was on data-driven information to identify these valuable themes (Saunders et al., 2019).

4.6 Ethics

In a research paper like this where a rather sensitive subject is explored, ethical issues are vital to take into consideration. On the other hand, the collected data is analyzed through human interpretation of this data, which makes it even more important to understand the ethical approach (Saunders et al., 2019).

Ethical issues appear to the surface from the moment of the initial contact with the representatives of the corporations. Here it is vital to create an informed consent where the possible participant gets a briefing of the purpose of this paper, the design and consequences of their participation (Brinkmann & Kvale, 2018).

For the primary data, this paper supports the information retrieved through the interviews. Because interviews are prone to being influenced by external activities, the authors spend all their effort into creating an environment that is proactive and comfortable for both parties (Saunders et al., 2019). Taking this into consideration, the researchers gave the interviewees also the possibility to be anonymous and their information would be dealt with in confidence. To avoid any ethical pre-consumptions, the writers also decided on removing all details regarding company personal information to ensure anonymity and avoid influencing the results of the paper and future research (Brinkmann & Kvale, 2018).

And lastly, to keep the interviews at all time objective and professional the authors tried their utmost best to avoid bias and lead the conversation in a sophisticated manner that both parties
experience constructive and insightful. Furthermore, the interviews were executed by the researchers without any preconceptions and predisposed beliefs regarding the corporation at hand (Saunders et al., 2019).

4.7 Quality Criteria

A qualitative paper can only make a contribution to the scientific community by being trustworthy and meeting certain criteria (Bell et al., 2019). By abiding to these criterion of trustworthiness, the authors hope to ensure a paper that reaches the paramount in the potential of the respective researchers and a qualitative paper that contributes to the sustainability efforts of respectable corporations. According to Guba (1981), trustworthiness consists of four criteria, but for this particular paper, the focus and highest relevance is with credibility and dependability.

4.7.1 Credibility

For a paper to be well respected within the scientific community, credibility of the data at hand is seen as an important criteria (Bell et al., 2019). This adds an extra dimension of conceivability to the paper. The researchers pursued a range of methods that added credibility to the paper and the method at hand (Zikmund et al., 2012). Initially, the selection of interviewees was made after a thorough investigation regarding relevant actors that would contribute to all sides of the research. On the other hand, these results were strengthened with sustainability reports from the supermarkets in Sweden. These reports are crafted by a team of experts in each corporation, and are the benchmark for sustainability efforts at each public corporation in Sweden.

4.7.2 Dependability

To understand if the findings in this paper are trustworthy, it is vital to look at the complete approach of the research thoroughly (Guba, 1981). For this paper, the initial basis was crafted by forming a literature review that was built on credible research articles relevant to the subject at hand, databases Primo & Research Gate were used. This is due to the broad availability of peer-reviewed articles and their significant credibility. The usage of these papers in the literature review broadened the knowledge and displayed a well documented review on both the main subjects of sustainability and digitalization. Later on, this same thorough procedure was used for the development of the model at hand and the findings. Although this process is
rather labor exhaustive, the authors have been very peculiar throughout the development, and kept track of all the steps of the research process (Bell et al., 2019).

4.8 Method Criticism

Although each research strives to be on an award winning level, each study is limited and this paper is no exception on the norm. The chosen subject is quite relevant and a vast variety of people have an opinion on sustainability. This also causes sustainability to be a popular subject for a research paper, causing the sustainability managers and representatives of the corporation to be oversaturated in interview requests. Which ultimately leads to a large decline of requests, which might cause limitations regarding the validity of the paper.

On the other hand, digitalization is an emerging term that defers vastly within the industry how it is being applied and executed. Causing the danger to arise that the obtained information might not be homogenous and applicable for the wider industry. Additionally, the ever existing time pressure that is typically present in a thesis research caused certain departments and representatives to not attend interviews. Which causes some of the information to be limited and lacking depth.

Finally, due to both the researchers and participants' mother tongue not being English, possibilities of misunderstanding arise. This ultimately could mean that the paper misses out on treasured observations that could slightly alter the results (Bell et al., 2019).
5 Findings

This part of the paper presents the empirical findings from both primary and secondary data aspects. It tries to strengthen and increase legitimacy through extensive qualitative data. As earlier stated in the method, the interviews are the primary data source. To complement these interviews, sustainability reports will be used as secondary data to increase the legitimacy and accountability of the findings. All the interviewees will be anonymous.

5.1 Primary and secondary data collection

To gather primary data seven interviews were conducted. Two different sustainability managers (A & B) were interviewed during this research at two disparate times, from two divergent supermarket chains. The respectable participants each have over 21 years of experience in their respectable supermarket and retailing field. They have little to no influence on each other. In order to strengthen the managers' statements and look at them from different perspectives. A select group of two sustainability experts (Z & Y) and two digitalization experts (W & X) and one supply chain manager U were invited on separate occasions to take part in an interview. The consultants' statements will be used to complement and invigorate the sustainability managers' claims in regards to sustainability as well as digitalization according to the questions at hand.

To understand how companies have adapted to the sustainable recommendations of Sustainable development goals (SDGs) as well as global technological implementation possibilities, a sustainability reporting review has been conducted on four of the biggest supermarket operators in Sweden (ICA Gruppen, Coop Sverige AB, Bergendahls Food AB, and Axfood AB). As earlier suggested, there is a risk of shadowing within the reports (Elkington & Rowlands, 1999). Due to the Swedish law enforces companies with more than 250 employees, the balance sheet has more than 175 million SEK or net sales above 350 million SEK to conduct one sustainable report each year that needs to be checked and inspected with auditing (Bolagsverket, 2021). This gives a reason to believe that no to less shadowing has been conducted.
5.1.1 Sustainability

To some extent, all of the companies have implemented and are using the SDG’s as a fundamental framework as well as following the basis of the triple-bottom-line (ICA Gruppen, 2021; Coop Sverige AB, 2021; Bergendahls Food AB, 2020, Axfod AB 2020), which can be an obvious statement due to the SDG theoretical framework being created from it. Manager A and B both mentioned during each of the interviews that sustainability is one of the most important fields and that several aspects need to be taken into consideration when it comes to the supermarket industry. These aspects are in line with the triple-bottom-line, such as environmental and climate, welfare, and social commitment to the community (internal and external). These aspects are important to all stages of the organization, such as in the stores and all the way to the top of the hieratical pyramid. From an environmental standpoint, all of the companies aim for an increase in their understanding from an above-down view, such as implementing a deeper understanding of plastic usage and general food spill. While some of them are aiming to become net-zero from the climatic point of view (ICA Gruppen, 2021). Others are aiming to become the greenest (Coop Sverige AB, 2021; ICA Gruppen, 2021).

Both of the managers have joint views on sustainability where A sees it as a challenge that we all can contribute towards, and B focuses on environmental aspects such as increased life length and minimization of waste. Both the managers understand the ethical dilemma sustainability can bring and legitimately emphasize the SDGs as guidelines and recommendations. The use of SDG gives a better understanding of supplier production knowledge, which can be challenged in case of ethical dilemmas. Through understanding the full supply chain by incorporating the view of human rights, corruption, the working environment, and the environment (Coop Sverige AB, 2021). From the environmental perspective, e.g all of the companies aim for an increase in understanding of reviewing their plastic usage and decreasing it. Hence, decreasing the usage does not mean excluding it, since it has the possibility to increase a food's lifetime (Axfod AB 2020). All of the companies are aiming for a decrease in pollution and a greener environment. The supermarkets have explicitly explained their social aspects which aim toward awareness of diversity but only some increased health of employees through different commitments and how the change is planned.

A and B see SDG as an important factor. The importance of SDGs is also strengthened by the sustainability experts, where Z means that the 17 SDGs give a broad understanding of
sustainability. While Y also expressed this clearly and sees a trendline within corporations that the SDGs are a good guideline throughout their day-to-day operations.

“I think they are good though, it gives a broad understanding to sustainability, it is not just climate or the people, it gives the whole picture.” - Z, 2022

“It is not really a SDG as a main focus, but it's a guideline on the where we want to impact... Some of our clients are focused and highly committed to them.” - Y, 2022

Both the managers explain the different strategies their companies have taken to reach the sustainable targets set by the corporations. Manager A means that they are very tied to their owners' decisions but that is done through democracy, where the club members are involved. Hence, understanding their customers' and members' purchasing patterns affects their products. However, they do not have the last saying. A means that more needs to be taken into consideration, such as the social impact one can have, as well as the environmental aspects (soils, water, etc.) all the way to animal welfare. B keeps it very general and focuses on the classical TBL view, but takes diversity and equality into an important aspect. This suggests that an inequality-adjusted TBL has been created, thus creating its own model. Moreover, both the manager's organization has a fundamental view of the TBL. It is very clear that they both as well as all the companies are focusing on challenging all its perspectives.

The interviews showed that ESG tendencies toward increasing legitimacy both internally and externally exist, such as increasing locally produced products and preventing health issues. Its prevention occurs through the use of certificated and trusted suppliers. A, B, X, and Z states that it is very important to label the sustainable goods in order to increase consumer awareness, affecting the sustainable purchasing in its upgoing trend, but customers find sustainable product pricing to be high. However, regular less sustainable products such as meat are affected by price increases and tax regulations. This was also confirmed by interviewee Y, where both companies and consumers want to be more sustainable but get limited by possibilities or fear of being seen as bad by the outside world.

An important aspect that interviewees A and B perhaps understandably not brought up is the risk of their sustainability activities being perceived as greenwashing. Both the sustainability
experts Z and Y put a large emphasis on this, stating that companies are struggling to find the right balance between coming over as a genuine sustainable company that tries to better the environment or as a company that just does it for publicity and just greenwashing.

“The biggest risk is greenwashing..” - Z, 2022

“. there's a lot of blah blah going around and we really focus on the facts and not on, for example, is plastic better than paper?” - Y, 2022

X describes it as a concept to prevent unsustainable conduct.

“. I see it from like a distance is that we really double-check the origin from our activities. We truly do not want to work with greenwashing, because this will harm the name of the company. “ - X, 2022

However, other risks to sustainability were identified and present in the supermarkets of both participants A & B. Where A introduced a good example of this, the danger of information overload in these efforts. If the companies make the efforts too complicated, the employees will lose their enthusiasm for it. These efforts have to be company-wide carried. Another outlook that was shared, is the risk of over internationalization. The Covid-19 crisis and now the war in Ukraine has made the supermarkets rather weary of this. Both on the product shortage level as the bad impact on the environment.

5.1.2 Digitalization

During the interviews, both of the managers explain an internal platform-based dashboard that aims to enhance their work with sustainability and primarily meet the SDGs. These platforms get daily updates through tools and control systems, such as waste management and CO2 regulations, thus collecting new data that can improve future sustainable engagements. ICA Gruppen (2021) aims for a data-driven transformation within the organization with the help of AI to increase advanced analysis to get a better understanding of pricing and increased customer value. They also aim to understand underlying processes, such as purchasing, inventory management, and advanced supply chain management. Axfood AB (2020) has a similar point of view mainly focusing on the data and analysis aspect. However, they do not explicitly go into depth on which technological tool. Bergendahls Food AB (2020) suggests
that technology investments are implemented in the majority of their stores, but also that the investments are towards the SDG’s. However, no technological explanations or deeper details are given. Z means that companies are limited in their work with digitalized tools and recommend more solutions to improve targets. Moreover, Y sees that there are various promising softwares’ that can help severely in this aspect but are not yet ready for broad adoption.

The subject of digitalization was also very relevant for the sustainability managers A and B, and although not directly their expertise, it was heavily intertwined within their day-to-day operations. In the supermarket of interviewee A, they see a clear pattern that digitalization aids their sustainability effort. One example given was the digital labeling solution that tracks the sustainable ecological footprint of each product, which also U supports. This is both handy for the consumer, but also especially for the corporation. Later on, this was also confirmed by the digitalization experts W, X, and U. However, they still see a lot of untapped potential. In the eyes of expert W, companies still use it too much as a buzzword and do not use the technology in the right way yet. According to Y, the various companies they work with truly try to adopt digitized efforts to increase the impact directly on the environment and prevent human error. An example of this is the switch to remote working.

“.. methods that have been used so far are really Excel-based, manually inputting data... a lot of mistakes.. we used almost completely digitized platform.. So that is where digitization in sustainability is really important.. the software for optimizing certain aspects in buildings to lower carbon, offset energy cost, energy usage.” - Y, 2022

For the supermarkets, another important aspect of digitalization is the data analytics involved with it. Interviewees A, B, W, Y, and U explained various ways they use the big data they receive on a regular basis. At the moment the major impact it has on predicting buyer behavior trends. This reduces the wastage and wrong purchases at both supermarkets.

“Economic waste now, but that is a kind of sustainability waste as well because if there are an economic waste, there are a big chance that there will be food waste.. How much did we sell and we are looking the last couple of weeks, how much have we sold?” - U, 2022

This means that U uses digital forecasts to prevent overstocking resulting in waste.
“AI or machine learning more frequently with that type of data because we have a lot of data for the customers or the customers have a lot of data in customer behaviors” - W, 2022

The use of customer indexes or customer understanding programs analyzes this data and tries to optimize the shopping experience for the individuals. Interviewee W confirmed that data analytics is very important, but sees that most companies still do too little with it, and often do not know how to apply it. While X and Y truly have data analytics at the core of each project.

“Without data, you are nothing.” - Y, 2022

“It is for us the basis of most projects, without data we are just nothing. We truly try to analyze the data that the companies bring us” - X, 2022

In their strategy, they already use AI technology, and this would really bring data analytics for most companies to the next level.

“I try to implement AI technology in this that it can understand this information much better than us humans.” - X, 2022

“We have implemented a couple of digital what do you call it, robots. Digital robots. But yeah, We have some kind of physical robots in our newest online warehouse in Stockholm” - U, 2022

U in this case is referring to IoT and AI-based solutions.

The next industrial revolution (Industry 4.0) combined with IoT seemed to be a bit out of scope for both interviewees A and B. Nevertheless, the answers they provided regarding their supply chain efforts clearly showed that they are working with this. These emerging terms are however not used in their departments. Especially interviewee Y explained that the Internet of Things is already being applied in complete supply chains in Sweden. X always emphasizes IoT as the most effective solution. The results are that these are more efficient, less human errors, and have a smaller impact on the environment. Participant W is not active in this department of digitalization.
“We try to use digitalization to limit human errors, and make the life much more enjoyable for our employees” - X, 2022

However, another point of view is presented later in the interview;

“But the majority of them are actually not focused on the employees, rather on the customers or businesses the companies targets.” - X, 2022

Meaning, that the corporation of X helps digitize it for the business in focus.

The artificial intelligence technologies are slowly being implemented in both the supermarkets of interviewees A and B. A puts a good example of this, that to understand a customer's habits artificial intelligence tools are implemented, such as sustainable awareness customers receive more offers towards it. From the interviews, assumptions can be drawn that customers which are not sustainable-oriented will receive offers against sustainability, but increasing awareness will prevent this habit in the long run. Therefore, analytical tools are implemented to further understand consumer behavior and patterns. Both the experts explained the potential this technology has and how in the longer future it will improve the consumer experience and the average employee's job satisfaction.

Both the managers and all the experts that participated in the interviews finalized that sustainability and digitalization are important pillars that should go hand in hand, such as increasing efficiency.

“In the future, It must go hand in hand. Uh, it is necessary.” - A, 2022

“I think as the world develops now, everything will go towards it.. We also work with automated orders... fits almost perfectly with the purchase behavior..” - B, 2022

“.. digitalization will help us produce and understand things way better” - Z, 2022

“So I think or we think as a company, digitization is a key element to not only speed things up, but also enable more of a circular economy, sustainable economy.” - Y, 2022
“.. the technological solutions will allow even more possibilities to really help the sustainability efforts of the future.” - X, 2022

“ No, no, no. I’m certainly convinced that it will only be more and more and more. We have only been starting to scratch the surface, basically, there is a lot to be done, and it is a lot of progress in front of us.” - U, 2022

Innovative solutions such as AI and blockchain techniques will be used for faster delivery and better sustainable products. The consensus is then also that these phenomena will only work more intensely together in the future, and will aid corporations in forming a more efficient and durable company.
6 Analysis

This section presents the analyzed method to interpret data. It tries to lay an objective view on sustainability and digitalization while explaining its perks as a combined actor. For the authors to analyze the found data, both collected through interviews and sustainability reports, the objective is to understand these data in-depth which conceivably supports the research question and gains the optimal results. The methods used for this analysis will be according to an earlier specified process.

In Appendix B, the authors show the thought process starting this thematic analysis. Initially, the interviews were coded, and ultimately three relevant themes were discovered within the findings according to the stated analysis style. These three themes will form the basis for the analysis and will be strengthened by the sustainability reporting. The themes brought forward are highly relevant and relatable to the research question at hand. Besides that, they also complement each other, and offer a solid baseline for a thorough analysis.

6.1 Sustainability Approach

The supermarkets in Sweden clearly have sustainability as one of their main pillars in both the present and long-term strategy. This comes both out of necessity and internal beliefs within the organizations. On one hand, the government and consumers understand the importance of the issue at hand, and will according to the beliefs of the interviewees not buy in the long term from unsustainable/unethical corporations. While on the other hand, the main supermarkets in Sweden are aware of the importance for their employees, consumers, the environment and their existence.

Within the approaches used by the companies, major similarities and objectives can be seen that they are working on. A prime example of this is, due to the turmoil around the world in the past two and a half years, the importance of local production and simplifying the supply chain is at the top of priorities. This has multiple reasons, initially due to the decreased dependency and instability in the supply chain, but also the major impact this has on the environment. One of the interviewees also stated that the majority of emissions of these supermarkets came from the transportation of foods across the world. Another major pillar that businesses are working on, is to reduce store level waste. This is a major challenge due to the
brisk product assortment at hand. But experimentation with innovative and ever more efficient systems is present at all supermarkets. That is why a significant amount of efforts are put into the supply chain to develop this into more efficient systems that work better for the environment and employees.

To stay organized and efficient within these approaches, each corporation showed that the usage of SDGs was an important guideline, which formed a solid basis throughout their sustainability efforts. Besides that, in large scale projects it is the ideal supporting framework that gives employees a quick understanding of the goal at hand and makes it easy to grasp. A particular model to strengthen and/or complement the SDGs was not identified. However, many of them are looking towards developing or finding a model that could truly benefit their efforts. The basis of the triple-bottom-line is also identified in their sustainability efforts, both mentioned by interviewees and present in their reports. This principle was a key cornerstone for enhancing the internal sustainability principles.

However, within the sustainability approach, certain risks also appear that cannot be forgotten. A pressing topic that is a challenge both for the supermarkets as sustainability consultants is greenwashing. The risk that the efforts from the companies are perceived as greenwashing is definitely present. Besides that, by perhaps switching too fast to super sustainable solutions, the business could lose customers' trust, both in the more traditional shoppers and the youngest generations. Lastly, a corporation has to stay very agile, due to the danger looms that all focus is put on one certain solution that later on may be perceived as rather harmful or dangerous to the environment. A good example of this is the asbestos building materials used in the second part of the 20th century that were later proved to be harmful in certain occasions.

6.2 Impact of Digitalization

Digitalization has made a stellar impact on everyone's life in the past decades. Especially in the Covid-19 pandemic, the impact was tremendous. It allowed businesses to remain open and function at a certain level. Supermarkets in Sweden are working hard to capture the true potential of digitalization. On a high level, this is done by implementing various controlling softwares in the supply chain to aid efficiency and limit human errors. This also aids in higher employee work satisfaction, and provides the business with valuable data that can be analysed later on. Supermarkets are also experimenting with automatic warehouses, which would
significantly diminish the waste levels, and reduce emissions through efficiency and optimization. In the supply chain, Industry 4.0 solutions are adopted on a rapid basis and seem to make a positive impact.

However, digitalization also makes a rather significant impact these days on the customer’s understandings. Through emerging technologies like big data analytics, supermarkets get a deeper understanding of the demands and trends of consumers. This is at the moment being combined with AI-based consumer suggestions to the members of the companies at hand. It takes the guessing out of the suggestions and makes it based on actual data and trend lines. One interviewee stated that this will only become more important for them and will increase customer satisfaction and ultimately reduce food wastage. The Internet Of Things (IoT) applications were not yet adapted on a mainstream level, but each company has a dedicated department for these emerging digitalizations.

On the other hand, the majority of participants explained that the challenging nature of digitalization is within the ever changing essence. The Covid-19 pandemic showed this clearly with the sudden shift to remote working. Looking at the supply chain and data understanding, the corporations are shifting rather swiftly to cloud based learning and implementing blockchain technology. An important aspect to keep in mind ultimately, is also the dangers involved with digitalization. Predominantly the sustainability consultants pressed on the fact that these solutions also consume lots of energy and can also use resources that are limited and harmful to the environment. So a critical look at these technologies is vital for the longevity of the digitalization efforts.

6.3 Sustainability Opportunities Through Digitalization

Throughout the interviews, all participants have expressed that they are convinced sustainability will go hand in hand with digitalization in the future. The majority even called it a necessity to stay relevant. The supermarkets also stated within their sustainability reports and interviews that digitalization aids them in accelerating their sustainability efforts. However, there is still a rather significant amount of untapped potential that offers opportunities to streamline different aspects within the corporations. A prime example is one of the supermarkets is seriously considering into designing a software that will simplify supplier recognition. Which will tackle scanning and controlling all certificates and making sure the
products come from a sustainable and responsible location. This software is still in its early stages but it will be supported by AI technology and big data. For the consumers, the companies are investing in the so-called smart food postboxes which allow people to order online and pick up all groceries directly. The supermarkets introduced this during Covid-19, but are now working hard to combine this with data analytics to predict more accurately what their customers want and reduce waste as a result.

On the more technological and emerging technologies side, industry 4.0 still has a lot of untapped potential that can make the life of employees easier and help in the sustainability efforts. The AI department of one of the supermarkets is fully focused on creating technologies that will aid their employees in day-to-day operations, and are also looking for more sustainable and local solutions for the assortment in the business. On the other hand, the saying “knowledge is power”, is very actual for these businesses. All of them try to use big data analytics on a more broader scale to understand the consumers, but also their suppliers. Which will create a more efficient and streamlined operation that will aid significantly in reaching the SDG’s set up by the UN and the corporations themselves.
7 Discussion

Within this part, it is the aim to discuss the findings and how SDG 8.0 affects technological innovation that can be applied for future sustainable development engagements. It also touches upon the main sustainability frameworks previously mentioned in the paper by the researchers. The fundamental aspect of sustainability could be considered crucial, especially as macroeconomic elements are constantly in effect. Thus, sustainable strategies need to be implemented to meet the requirements and expectations. This is in order to avoid performing unethical or unsustainable actions such as greenwashing. SDG 8.0 and 8.2 innovation engagements contribute to technological improvements and therefore aid organizations in exploring new opportunities as well as improving current methods.

In this paper, the authors have presented relevant literature to strengthen the arguments towards the research question. To improve and merge both the subjects (sustainability and digitalization), it is essential that the collected literature has been integrated and used in a way to compensate for one other. This resulted in a new framework where sustainability efforts are accelerated through digitalization.

From the interviews with managers, sustainability and digitalization experts relevant themes have been found through the analysis. The interviews showed that corporations need to conduct sustainability strategies in order to meet not only legislation but also improve their legitimacy towards customers and philanthropic beliefs. These commitments should consequently lead to an already sustainable consumption but this is distorted by a belief that the consumption already is sustainable from the customer's perspective, hence, consumers are not yet sustainable on a large scale. However, consumers’ behavior is changing towards sustainable products due to tax regulations and price changes in debatable products. Moreover, sustainable products are seen as expensive. It can also be assumed that moving the purchasing habits from unsustainable customers toward more sustainable ones will raise the supermarkets’ sustainability outcome and work towards targeted SDGs. One can argue that without sustainable customers there would be no opportunities and future towards sustainability.

The supermarkets’ within this study are all obligated to conduct sustainability reports, it is, therefore, vital to follow a framework. The sustainable development goals are therefore the actual framework to work from and TBL is a way to guide the fundamental commitments, such as economic, social, and environmental aspects. On the other hand, ESG can be argued to be a
framework due to its way to increase citizens’ trust (Camilleri, 2017). This is because of the sustainable commitments of the SDGs. Its intention can therefore be seen as a key to increasing transparency in sustainability reporting ensuing financial gains (Sharma et al., 2020).

The findings, as well as the literature review contributed to the possibility of combining digitalization as an aid with sustainability. Digitalization comes with a lot of possibilities, such as the ability to capture and understand sustainable commitments through data gathering and analytics. The digitalization key aspect in regards to sustainability is to increase knowledge of ecological footprint. It enables an organization to not overstock, predict, and understand trends more accurately. Moreover, it has the potential to increase workers' job satisfaction.

Digitalization is a vital measure to increase an organization's productivity for a better environment. However, potential risks from it may occur, such as hacking infringement, personnel data destruction, increased sustainability number shadowing, etc. It is important to have trustworthy programs, technologies, and employees, which might be easier said than done. These risks might be prevented by enhancing internal knowledge, preventing phishing, and caring for employees' health. Even though digital transformation can have a successful implementation it still has a huge impact on the environment, due to data warehouse pollution and increased CO2 emissions. At the moment, this cannot be prevented during a full technological implementation, but can be compensated by planting trees, and giving back to the community and environment.

Supermarkets have responsibilities that go beyond selling food. They need to understand their supplier's supply chain, care for the community and environment while meeting sustainable goals and increase awareness among customers of different socio-economic assistance. This, in the long run, makes sense since without the environmental aspects a supermarket’s business model will not work, the same goes for the social and economic views. However, they should not do it alone, they need to enforce regulations upon their suppliers to prevent unnecessary damage. It is within a supermarket’s interest to be sustainable.
8 Conclusion

This section presents the concluding thoughts and explains the final results from the empirical findings in combination with earlier presented frameworks. It goes to the bottom with the future of sustainability and digitalization as well as answers the research question.

Through the analysis of the findings at hand from both the case study interviews and the external sustainability reports, it can be concluded that the phenomena at hand: *How does sustainability efforts of corporations get accelerated by the aid of digitalization?* Was answered. The participants of the interview showed on numerous levels that digitalization goes hand in hand with sustainability and helps expedite these efforts. This was confirmed by both the sustainability managers at the supermarkets as well as the external sustainability and digitalization expert. On the other hand, the model brought forward by the authors seems to be rather relevant, additionally it concretely and accurately explains the phenomenon. The analysis demonstrated that supermarkets in general work intensely with sustainability and make it one of their pillars within the organization. To work with this phenomena, the UN SDGs are used as a solid basis and guidance. The TBL and ESG principles also are being applied on a high scale level.

Moreover, the findings of this thesis made clear that the emerging technologies originating from Industry 4.0 are already being implemented by the supermarkets at hand. Data analytics is aiding the companies in understanding their customer behaviors on a deeper level and this results in less wastage and higher consumer satisfaction. On the other hand, the AI solutions that the companies have implemented through their designated departments are focused on aiding the consumers in giving them more accurate suggestions and increasing their experience at the established stores. However, most of the technologies are still in the beginning stages for the corporation and have a lot of untapped potential that will benefit the business in the long term both financially and on the sustainability aspect, according to the digitalization experts. All the participants in the interviews held believe that digitalization will play a key role in the sustainability efforts of corporations around the world.

On a concluding note, whether the findings of this paper will be proven correct in the long run depends on a variety of factors that are understandably out of the hands of the authors. However, the empirical findings presented clear patterns that answered the research question.
and confirmed the model at hand. The paper ultimately aided in filling a research gap that was present in the application of digitalization in the sustainability efforts of corporations. However, the paper’s findings would benefit from broadscale research that could address the possible (negative) effects of these mass digitization efforts on the employees besides the positive sustainability effects. The conclusions made in this paper form an exciting basis for further peer-reviewed research in this field and specifically extending this phenomenon into the broader consumer industry which could make the model applicable in a broader use sense.
9 Limitations

As a final part of the paper, the authors discuss the limitations and flaws that have to be taken into account when researching and understanding the paper at hand. It also suggests solutions for future work. Even though this thesis concentrates on a wide variety of subjects (SDG, TBL, IoT, AI, BDA, etc.) surrounding the research question at hand, while studying and reading this paper it is wise to keep in mind the range of limitations that could have affected the outcome of this paper. Looking at it from the beginning, the author’s could not arrange interviews with all the managers of the major supermarkets in Sweden. This was due to the busy schedules of the managers and the wide requests for interviews they get on a daily basis. Therefore the findings of these interviews can be perceived as limited. On the other hand, due to the focus being on the supermarket industry in Sweden, the results found are not representative of the larger consumer industry. Thus, research in the near future could use this as a basis and extend it towards a more broader carried industry like the consumer industry.

Besides that, the case study was limited by the time frame at hand, restraining the researchers from reaching a larger audience of participants for the interviews. Although the authors found seven qualified interviewees in three different areas of expertise, a larger amount could possibly alter the results found. This could also offer a more in-depth case study that could be translated to other industries and countries.

Lastly, due to the interviews being executed in a semi-structured way biases should be taken into consideration. This is because the answers presented are the participants’ own interpretations of these questions. Besides that, the responses can be incomplete due to loss of memory, limited to sharing information or other external aspects. Another aspect of bias that can not be forgotten is the fact that all interviews at hand were taken in English with non-native speakers. This could result in information being misunderstood or the data being falsely interpreted.
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Appendix A - Interview Questions

Interview: Outline/introduction
1. Presentation of yourself and your position
   ● Have you held the same position since the beginning?
   ● How long have you worked in the supermarket?
   ● What are your responsibilities?

Interview: Sustainability
2. What is sustainability for the enterprise?
   ● What is sustainability to you?
   ● How does X work with Sustainability? - Theories, concepts, models, laws?
3. Are you familiar with the SDG goals? And are they important for your business?
   ● How do you work with them in particular?
4. How do you maintain the quality of your sustainability efforts?
   ● For subsidiaries?
5. What would you say is the biggest risk when it comes to sustainability?
   ● For consumers & the company
6. How do you look at sustainability financially?

Interview: Digitalization
7. Does your company use digitalization as an aid in accelerating its sustainability efforts?
   ● Any concrete examples?
8. What are the corporations' digitalization efforts?
   ● How can this be improved?
9. Does X use data analytics to understand consumer behavior?
   ● Do consumers already buy sustainably responsible?
10. Within your supply chain, do you use any technologies/software to reduce your ecological footprint?
    ● Any concrete examples?
11. Has X already implemented any artificial intelligence solutions that help employees in their digitalization efforts?
    ● Any concrete examples?
12. How do you think digitalization and sustainability will go hand in hand in the future?
Appendix B - Thematic Analysis

<table>
<thead>
<tr>
<th>Sustainability Efforts</th>
<th>Importance of SDG</th>
<th>Sustainability Risks</th>
<th>Digitalization Efforts</th>
<th>Changes in Technology Usage</th>
<th>Opportunities in digitalization</th>
</tr>
</thead>
<tbody>
<tr>
<td>- More local produced products</td>
<td>- Extremely important, guideline for net-zero goals</td>
<td>- Internationalization and global dependency</td>
<td>- Softwares to aid supply chain efficiency</td>
<td>- Remote working</td>
<td>- Smart Food Postboxes</td>
</tr>
<tr>
<td>- Increased efficiency &amp; reduced emissions</td>
<td>- Good basis, but needs extra guidance</td>
<td>- Losing customers trust</td>
<td>- Consumer data analytics</td>
<td>- Shift towards cloud based learning</td>
<td>- Supplier recognition software</td>
</tr>
<tr>
<td>- Reduce store level waste</td>
<td>- The red thread in sustainability efforts</td>
<td>- Greenwashing</td>
<td>- AI based consumer suggestions</td>
<td>- Data analytics for increases consumer understanding</td>
<td>- AI Technologies to aid employees</td>
</tr>
<tr>
<td>- Supply chain technologies for better work environment</td>
<td>- Supporting framework for projects</td>
<td>- Over focusing on the wrong solution</td>
<td>- Sustainablity footprint labeling</td>
<td>- Blockchain technology</td>
<td>- Broader use of big data analytics</td>
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<tr>
<th>Sustainability Approach</th>
<th>Impact of Digitalization</th>
<th>Sustainability Opportunities Through Digitalization</th>
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<tbody>
<tr>
<td>- Sustainability Efforts</td>
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