



Master of Science in Information Systems
Digital Business Systems and Business Analytics.

ASSESSING THE IMPACTS OF GREEN INFORMATION SYSTEMS IN A
NORWEGIAN POST/LOGISTIC COMPANY: A QUALITATIVE CASE STUDY.

Abdullah Hassan Al Eboudi - 1058

Juliana Araújo Grøttjord- 1062

A report submitted in partial fulfillment of the requirement for the degree of Master of
Science in Information Systems in Digital Business Systems and Business Analytics.

Kristiania University College
Prinsens Gate 7-9
0152 Oslo
Norway

Abstract

This thesis investigates what impacts Green Information Systems have on the post/logistics sector in Norway, as well as how managers and employees view and use them. This study used a case study methodology with the Triple Bottom Line Framework to provide the theoretical lens for guiding the research. Managers and employees from one of Norway's largest mechanical terminals in the post- and logistics sector participated in semi-structured interviews.

The findings of this dissertation demonstrate that green information systems have mostly improved productivity and efficiency. This study also shows that the case company has a reasonable awareness of economic, environmental, and social factors, even if the financial objectives take priority - and have led to an imbalance between the three factors. The thesis addresses cause of this imbalance as well as how the Circular Economy may be able to achieve a sustainable balance by fostering a healthy balance between the Triple Bottom Line's three components.

Keywords: Green Information Systems, Logistic sector, Sustainability, Circular Economy, Triple Bottom Line Framework

Acknowledgements

The end of another important step in our lives is coming – we are finishing our master’s degree. The feeling of accomplishing something so big for us is mixed between the happiness of achieving one more step in the ladder of knowledge and a bit of sadness for leaving our student positions for a while.

Through this process we met many supportive people and without them we couldn’t have come this far. First, we would like to express our deepest gratitude to our supervisor, Associate Professor Wanda Presthus, for accepting the responsibility of guiding us. We knew that her profound knowledge, experience, and meticulous attention to details would make her the perfect supervisor for our dissertation. We are also thankful for her exceptional mentorship, always available to help, acting as our “defence lawyer”, giving tips and guidance, working extra hours and being rigorous when we needed. We will never be able to retribute all the valuable supervision and inspiration we got from her.

We would also like to acknowledge all participants. All the time spent to answer our interviews and showing us around the company. Each of them contributed enormously to this dissertation enriching the gamma of data we were able to collect.

Lastly, we wish to express our heartfelt gratitude to our families, friends, fellow students, and the entire faculty at Kristiania University for their unwavering support in various forms. We extend a special thanks to Marius Hanssen and Amar Wahid for their additional motivation and encouragement provided when we needed it the most.

We certify that the work presented in the dissertation is our own unless referenced.

Signature: Abdullah Hassan Al Eboudi and Juliana Araujo Grøttjord

Date: 21.05.2023

Total number of words: 18612

Table of Contents

- 1
- 1. Introduction 1
 - 1.1 Research Aim and Objective 2
 - 1.2 Approach 4
 - 1.3 Outline 4
- 2. Literature review 5
 - 2.1 Search for Literature 5
 - 2.1.1 First Stage 5
 - 2.1.2 Second Stage 7
 - 2.2 The development of Green Information Systems and the state today 9
 - 2.3 The Role of Green Information Systems in Green Logistics 13
 - 2.4 Framework Analysis in Green Information Systems 17
 - 2.5 Summary of Literature Review 20
- 3. Method 22
 - 3.1 Choosing the Research Design 22
 - 3.2 The TBL Framework as a theoretical lens for analysis 22
 - 3.3 Case Study and Research Method 23
 - 3.3.1 Focus and Boundaries 24
 - 3.3.2 The Case Company 25
 - 3.3 Data Collection 26
 - 3.3.1 Sampling 26
 - 3.3.2 Interviews 27
 - 3.4 Ethical Considerations and confidentiality 28
 - 3.5 Data Analysis 28

3.5.1 Summarising and packaging the data	29
3.5.2 Repackaging and aggregating the data: finding themes and trends.....	29
3.5.3 Constructing a framework: developing and testing propositions.	29
3.10 Summary of Methods	30
4. Findings and Analysis	30
4.1 Participant background.....	31
4.2 Green Information Systems and Sustainable Economic Growth	33
4.3 Perception and Adoption of Green Information Systems.....	38
4.4 Gaps in Green Information Systems Adoption and Opportunities for Improvement.....	45
4.4.1 Gaps and Opportunities	45
4.4.2 Enhancing Sustainability through Green IS	47
4.4.3 Barriers to Green Information Systems Implementation and Solutions	49
4.6 Summary of findings	52
5. Discussion	54
5.1 What are the impacts of Green Information Systems on the post/logistics sector in Norway?... 54	
5.1.1 Economy.....	56
5.1.2 Environment	58
5.1.3 Social.....	60
5.2 Summary of Discussion.....	63
6. Contribution and suggested further research.....	64
6.1 Theoretical contribution	64
6.2 Practical contribution	65
6.3 Limitations and suggested further research.....	66
7. Conclusion.....	67
8. Bibliografy	68
9. List of Appendixes	74
9.1 Project Plan	74
9.2 Information Sheet and Consent Form.....	74
9.3 Guiding Questions for distinguishing interpretive research	76
9.4 Interview Guide.....	77
9.5 Transcript Leader 1	78
9.6 Transcript Leader 2	80
9.7 Transcript Leader 3	82
9.8 Transcript Leader 4	84
9.9 Transcript Leader 5	86

9.10 Transcript Leader 6	88
9.11 Transcript Leader 7	90
9.12 Transcript Leader 8	93
9.13 Transcript Employee 1	94
9.14 Transcript Employee 3	97
9.15 Transcript Employee 5	99
9.16 Transcript Employee 7	101
9.17 Transcript Employee 9	103
9.18 Transcript Employee 11	106
9.19 Transcript Employee 13	108
9.20 Themes from Interviews.....	110
9.21 Overview of Main Literature.....	113
9.22 Forms of theoretical contributions in the Information Systems context.....	114
9.23 Submission and declaration form for Bachelor's and Master's theses	116

List of Figures

Figure 1: Composing this dissertation and framing our contribution to knowledge. Adapted from Presthus & Munkvold, 2016.	3
Figure 2: Based on our literature review: Number of Empirical and Non-Empirical Papers per Publication Year 8	
Figure 3: Number of Empirical and Non-Empirical Papers per Publication Year (Université Laval et al., 2016 P 30)	8
Figure 4: Our illustration of the collected research on Green Information System Research Methods	9
Figure 5: Numbers of Green Information Systems Papers Publication Year (Idrissi, Corbett and Laval, 2016 p. 30)	10
Figure 6: Our Numbers of logistics related papers in Green Information Systems per year.	10
Figure 7: A generic form of the reverse and closed-loop supply chain in a single frame (Khor and Udin 2011 p 3)	16
Figure 8: The Sustainability Sweet Spot (Savitz and Weber, 2014).	23
Figure 9: Our case study focus and boundaries adapted from Miles and Huberman (1994, p.25).....	25
Figure 10: Internal supply chain pipeline. Translated from Company's own archive.	26
Figure 11: Our adapted Ladder of Abstraction from Carney 1990, cited by Miles and Huberman 1994, 94)	29
Figure 12: Leaders' Perception applied to the Triple Bottom Line.....	43
Figure 13: Employees' Perception applied to the Triple Bottom Line.....	44
Figure 14: AS-IS illustration of the case company adapted to fit the Triple Bottom Line.....	53

6

Figure 15: The Synergy of Circular Economy and Green Information Systems in Enhancing the Triple Bottom Line	56
Figure 16: Our Attempt at Mapping a Roadmap to the Utopia of the Triple Bottom Line	66

List of Tables

Table 1: Structure and description of the Master Dissertation	4
Table 2: Results from “The Basket of Eight”	6
Table 3: Results from Business Source Premier	6
Table 4: Results from Google Scholar	7
Table 5: Top Ten Author Affiliation by Country	7
Table 6: Definitions of Green Information Systems	11
Table 7: Definitions of Green Logistics	13
Table 8: Green Practices in the logistic sector	14
Table 9: Our literature review summarised into 3 main themes.....	20
Table 10: Overview of the main literature used in this dissertation.	21
Table 11: Criteria for Case Study. Adapted from Yin (2014).....	24
Table 12: Summary of our data collection	28
Table 13: Summary of the background of the participants from group A (Leaders)	32
Table 14: Summary of the background of the participants from group B (Employees).....	32
Table 15: Summary of leader’s perspectives on the “Green Information Systems and Sustainable Economic Growth”.....	37
Table 16: Summary of Employees perspectives on the “Green Information Systems and Sustainable Economic Growth”.....	38
Table 17: Summary of leader’s perspectives on attitude towards green Information Systems initiatives in logistics operations.....	43
Table 18 : Summary of Employees perspectives on attitude towards green Information Systems initiatives in logistics operations.....	44
Table 19: Obstacles to Implementing Green Information System Practices.	51

1. Introduction

“Computer scientists study how to make computers work better, whereas in Information Systems we study how to make organisations work better.”

Richard T. Watson, Introductory Statement at the Green IS panel at ICIS 2012.

Have you ever thought about the importance of logistics in our lives? Every and each item that you see in your house or work has gone through a supply chain system. For instance, the cosy couch you relax on, the dinner you cook, and the clothes you wear every day all had their natural resources removed before the components were made, packaged, and supplied to you by a complex global network (Flavin, 2019).

Now imagine how much could have efficiently been managed, reducing costs, waste and pollution in those steps along the chain. Environmental concerns have never been so popular as it is now. The pressure for reducing pollution and compliance to social responsibility is getting somehow tangled to the need of value creation, known as the “triple bottom line” from Porter and Kramer in 2006. The concept guides organisations to consider both profit, planet, and people simultaneously when doing business.

When it comes to distribution in logistics, it is relevant to point out the importance of Green Information Systems in the role for managers to acquire more efficiency in productivity, warehousing, distributing, forecasting and dealing with customers’ expectations.

Green Information Systems can be related to sustainable Business Process Management that focus on IT (Couckuyt and Van Looy, 2020). In contrast to Green IT that has focus on efficiency of energy usage and equipment utilisation, Green Information Systems drives toward sustainable designs and implementations of Information Systems inside business processes (Boudreau et al. 2007), applying automation to improve eco-efficiency, developing sustainable strategies with the help of decision support systems, and optimising environmental information flow (Thambusamy and Salam 2010). When it comes

to sustainable transformations, the primary role of Information Systems consists of creating action possibilities for sense-making or decision-making processes (Seidel et al. 2013).

Green Information Systems practices should be seen as an opportunity for improvement in productivity, cost reduction and enhancement of profitability, instead of seen as a cost of doing business. A careless approach to environmental-friendly solutions results in many forms of waste derived from the inefficiency of resources, while less waste means a more efficient organisation (Watson et al. 2008).

A straightforward example would be utilisation of smart logistics on the freight industry, where managers could base their decisions from machine learning reports on route planning, identifying where the trucks are fully loaded and come back empty or half-empty and setting strategies to either strengthen up the sales and distribution in those areas, or using third-party delivery companies, reducing costs and emissions. It is estimated that only in the European Union, trucks are empty 20% of the routes. Through digital transformation, if those routes would be optimised by 10%, the estimation is that the logistic industry could save €1-2bn and cut CO2 emissions by 1-2 megatons approximately (PwC, 2022).

1.1 Research Aim and Objective

Little research has been conducted to investigate how Information Systems has been enabling the managers from the post/logistic sector to implement sustainable practices and solutions. Although, Information Systems has been pointed out as a significant source of social and organisational transformation towards ecological friendly activities, it is still unclear what sustainable contributions of Information Systems are to the transformation of organizations (Elliot 2011; Seidel et al. 2013; Melville 2010; Watson et al. 2008).

In this research, the aim is to contribute by identify the impacts of Green Information Systems procedures and hopefully find potential applicable areas that enable sustainable practices inside the post/logistic. With this regard, we have formulated the following research question:

What are the impacts of Green Information Systems on the post/logistics sector in Norway?

First, we will establish a theoretical link between Green Information Systems practices inside post/logistics and business applicability's and possible potentialities. Second, an empirical study to unfold conclusions about:

- The perception and adoption of Green Information Systems practices by managers and employees.
- Green Information Systems' impact on practices within post/logistic sector in Norway.

An in- depth investigation will be done to look for gaps where Green Information Systems could contribute to a more sustainable oriented way of doing business in post/logistics.

For a better understanding of how our contribution to knowledge was framed, we followed the steps proposed by Presthus & Munkvold, 2016 in their guide for junior researchers in Information Systems.

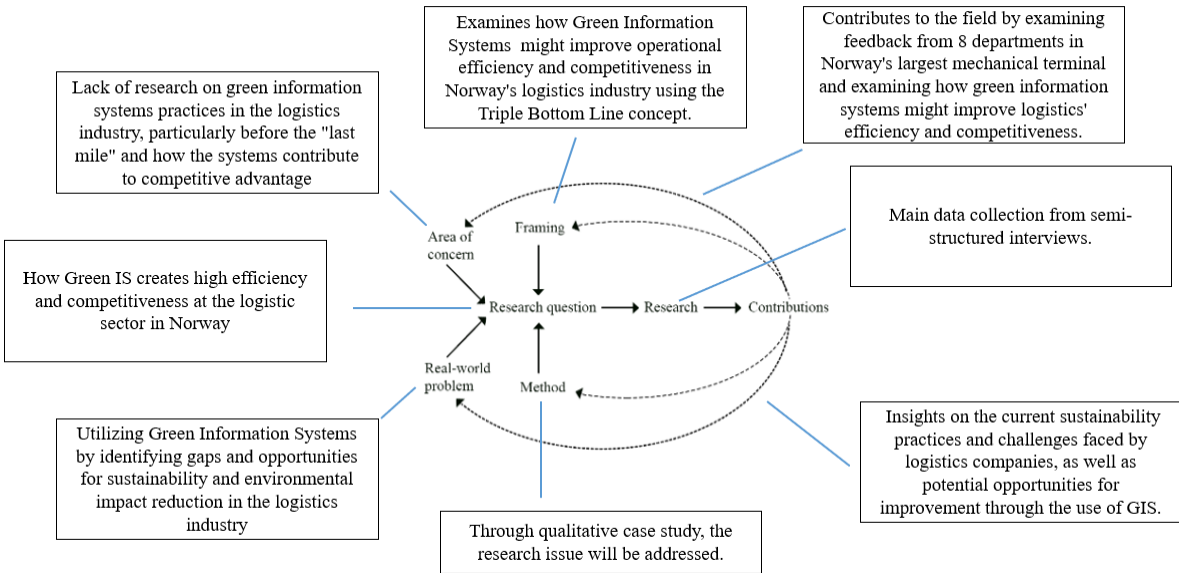


Figure 1: Composing this dissertation and framing our contribution to knowledge. Adapted from Presthus & Munkvold, 2016.

1.2 Approach

We chose a Case Study approach to answer our research question. The data was collected through in depth semi-structured interviews, a primary data generation method. We interviewed both managers and employees of a traditional post/logistic company in Norway to obtain a better understanding of how to answer our research question. The data was analysed under Miles and Huberman's ladder of analytical abstraction in chapter 3. Moving forward, we used the Triple Bottom Line framework to organise our discussion, concepts better explained in chapter 5.

1.3 Outline

The structure of the dissertation is divided into seven parts. The table below provides a brief explanation of each chapter:

Chapter	Description
1 - Introduction	Provides an introduction of the topic, the research question, aim and objectives, approach to the research and outline.
2- Literature Review	In this chapter we describe how the literature research was conducted, highlighting the development of Green Information Systems until now, the role of Green Information Systems in the logistic sector and presenting breathily the framework.
3- Method	For this chapter, we present how the research design was chosen, introduce the concepts of the Triple Bottom Line and our theoretical lens, the definition of Case Study, how the data was collected, the ethical considerations and confidentiality, the data analysis and a summary of the methods.
4- Findings	In this chapter we present our findings and analysis, participants' background, sustainable economic growth with Information Systems, the gaps in Green Information Systems adoption and implementations, how the logistic companies direct their goals according to the UN sustainable program and a summary of the findings.
5- Discussion	In this chapter we discuss the impacts of Green Information Systems under the Triple Bottom Line lens and give a summary of the discussions.
6- Contribution	For this chapter we present a theoretical and practical contribution, the limitations and suggest further research.
7- Conclusion	We sum up the dissertation presenting the answer for our research question.

Table 1: Structure and description of the Master Dissertation

2. Literature review

This chapter will present an overview of relevant research relevant to our objectives. To do so, a systematic review was conducted. Section 2.1 will provide a concept-centric overview in the context of Green Information Systems and Green Logistics. Moreover, to grasp their role within the logistic sector, Section 2.2 will present the development of Green Information Systems and the state today. Furthermore, section 2.3 will present the role of Green Information Systems in Green Logistics. Lastly, an overview of existing frameworks will be presented in 2.4, before summarising this chapter.

The process of finding literature involved looking through the academic databases that were available, as well as discovering literature that had already been used in earlier assignments and academic work. Further on, the literature search was twofold. The first stage explains how and where it was conducted. While the second stage focus on the main findings, uncovering Green Logistic practises, researching gaps and limitations for research. The foundation for the literature review was created by the twofold literature search and the previously found articles. The next sections will go in depth on how the literature review was conducted.

2.1 Search for Literature

A two-step method is involved in conducting a thorough literature search. While the second stage concentrates on the key findings and identifies gaps and research limitations, the first stage describes how and where it was done. The search period spanned 05.12.23 to 26.01.23.

2.1.1 First Stage

In this part of the systematic literature review we explain how and where our literature was conducted. Green Information Systems within Green Logistics is a relatively new phenomenon – and was found to have little existing research. We managed to make it less challenging by categorising the search with regards to our research objectives by focus on the studies available on “Green Logistics” and “Green Information Systems within logistics” separately. However, “Green” and “Sustainable” are used interchangeably, and therefore both words were included in our search when demonstrating the results in our tables. Keywords such as “Sustainable”, “Green Information systems”, “Sustainable Information Systems” were searched through the abstract, titles, and keywords to sort out the

articles.

To better understand Green Information Systems research, we examined first the publication outlets with regards to the “The Basket of Eight” journals. Table 2 shows how the articles are distributed in the different journals. Due to lack of research within our objectives, other journals were included to fully grasp the nature of green Information Systems. However, our first search in “The Basket of Eight” yielded 6 articles.

“The Basket of Eight” (alphabetical order)	Articles with “Green Information systems within logistics” as key concept
European Journal of Information Systems	0
Information Systems Journal	0
Information System Research	0
Journal of the Association for Information Systems	1
Journal of Information Technology	0
Journal of Management Information Systems	0
Journal of Strategic Information Systems	1
Management Information Systems Quarterly	4
Total	6

Table 2: Results from “The Basket of Eight”

We proceeded and added Business Source Premier and Google Scholar to broaden our article search. When combining various phrases with Boolean operators, we made every effort to strike a balance to avoid being either too general or too specific. Applying more filters might result in the exclusion of pertinent articles and a smaller search area. We exclusively searched the academic journals' peer-reviewed articles in both search engines. The first stage resulted in 137 articles. Our results are presented in Tables 3 and 4.

Business Source Premier	Total
Number of articles containing ("green logistics" OR "sustainable logistics") AND ("information systems" OR "green information systems") AND ("practices") in titles, abstracts, or keyword	173
Number of articles after confirmation review	37
Articles with ("green IS" OR "sustainable IS") AND ("logistics efficiency" OR "logistics competitiveness" OR "managerial perceptions" OR "managerial attitudes") in titles, abstracts, or keyword	196
Number of articles after confirmation review	44
Total of all articles after confirmation review	81

Table 3: Results from Business Source Premier

Google Scholar	Total
Number of articles containing “Green Logistics” in the title AND within information systems journals.	40
Number of articles after confirmation review	22
Articles with “Green Information systems” in the title	131
Number of articles after confirmation review	34
Total of all articles after confirmation review	56

Table 4: Results from Google Scholar

2.1.2 Second Stage

In the first part of this stage, we investigated the origin of each research to gain a broad picture on how the research was distributed geographically. In total we had 137 articles to investigate and looked for the paper’s authorship. Table 5 shows how the articles were distributed with regards to top 10 countries.

Country	Total	Percentage of total
United States	15	32,61 %
China	8	17,39 %
Germany	5	10,87 %
Japan	4	8,70 %
India	3	6,52 %
Malaysia	3	6,52 %
Sweden	2	4,35 %
United Kingdom	2	4,35 %
Netherlands	2	4,35 %
Poland	2	4,35 %

Table 5: Top Ten Author Affiliation by Country

Next, we narrowed it down to logistics related papers in Green Information Systems - and evaluated if the papers were empirical or non-empirical. As illustrated in Figure 2, most of the papers were non-empirical (e.g., essays, theoretical works). Additionally, the distribution of articles is relatively inconsistent and lacks a distinct pattern. In contrast, a similar analysis conducted by Idrissi, Corbert and Laval (2016, p.596-623), which focused on Green Information Systems can be seen in Figure 3. Their findings also exhibit an unstructured pattern before levelling off from 2009, indicating a maturity in the field (Idrissi, Corbert and Laval , 2016). Compared to our analysis in Figure 2, a noticeable increase is

seen from 2013, suggesting potential maturity in the logistic related papers in Green Information Systems.

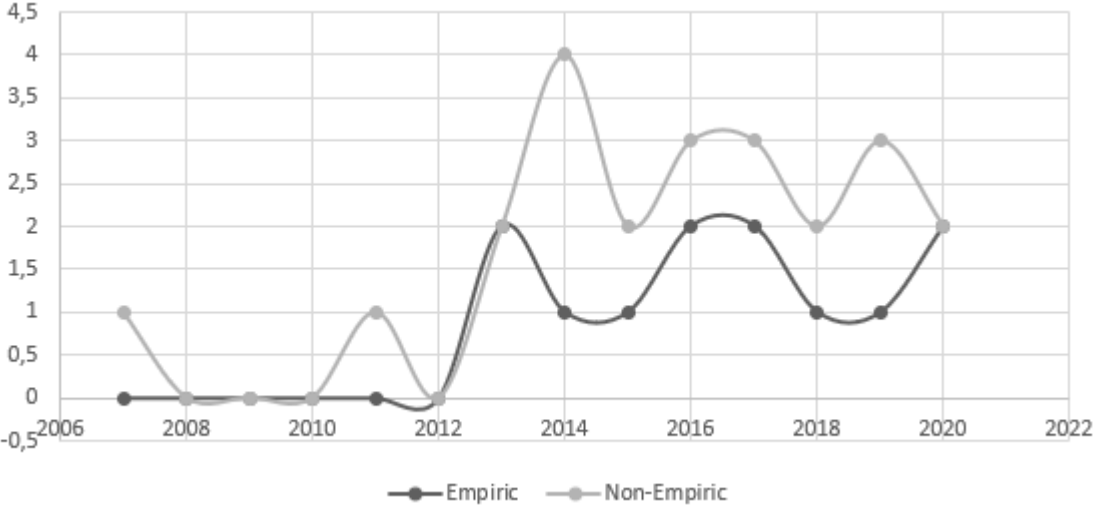


Figure 2: Based on our literature review: Number of Empirical and Non-Empirical Papers per Publication Year

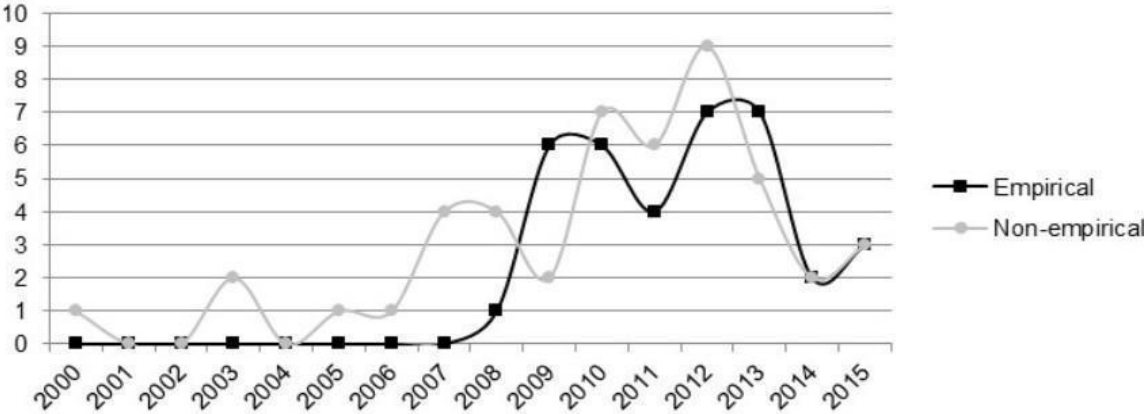


Figure 3: Number of Empirical and Non-Empirical Papers per Publication Year (Université Laval et al., 2016 P 30)

The examination of existing methodology within a research field is essential for ensuring the validity and dependability of a study. As shown in Figure 4, the methodology used is dominated by Systematic Literature Reviews.

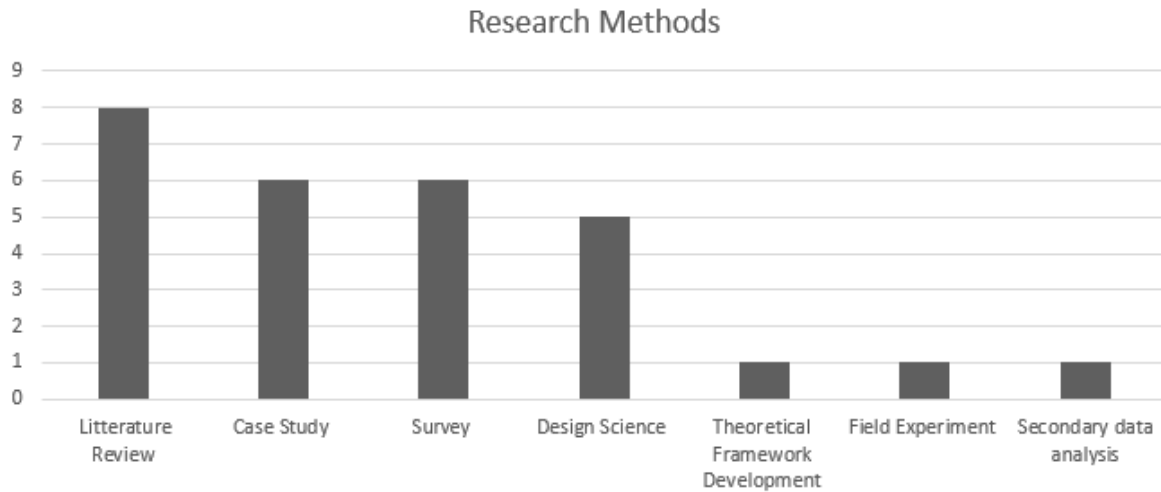


Figure 4: Our illustration of the collected research on Green Information System Research Methods

2.2 The development of Green Information Systems and the state today

Information Systems has come a long way since the discipline first formed in the late 1960s – and is expected to evolve due to its dynamic nature and ever-changing field (Boudreau et al., 2001). In the past two decades, Green Information Systems research has evolved slowly but steadily to become an established Information Systems subfield with major issues to solve (Idrissi, Corbert and Laval, 2016).

It has been argued that Information Systems have provided solutions for all kinds of human problems (Watson, 2008). However, research articles conducted by Dao, Langella and Carbo, 2011; Melville, 2010 showed a limited focus on sustainability prior to 2010.

As figure 5 shows the field had a peak that started from 2011. According To Idrissi, Corbert and Laval, (2016) the spike in the number of papers on Green Information Systems in 2010 and 2011 can be attributed to special issues on the topic being published. For example, in 2010, two papers on Green Information Systems were published in the MIS Quarterly as a call to action for Information Systems researchers, which accounted for nine out of the twelve papers published in 2011.

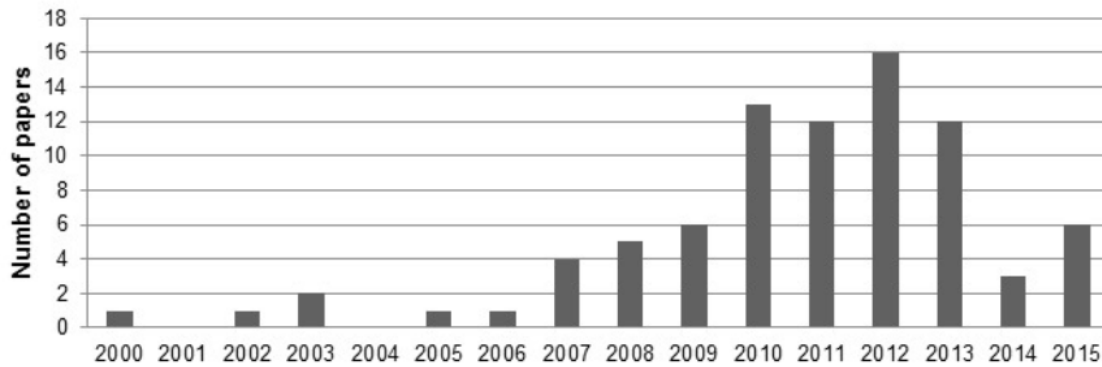


Figure 5: Numbers of Green Information Systems Papers Publication Year (Idrissi, Corbett and Laval, 2016 p. 30)

In comparison, we examined the amount of published Information System papers that were related to logistics as presented in Figure 6. We could not find relevant literature to our research aim before 2007 – but have a spike after 2013.

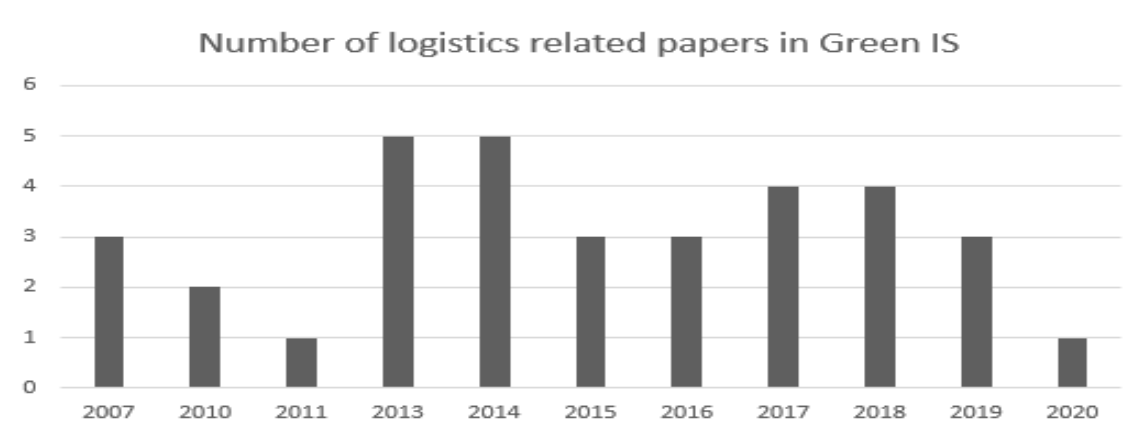


Figure 6: Our Numbers of logistics related papers in Green Information Systems per year.

According to a global UN survey “*never before has world opinion been so united on a single goal as it is on achieving sustainable development*” (Watson, 2008). Elliot (2011) argues that individuals, communities, organisations, and governments must change their unsustainable behaviours to more sustainable ones which aligns with the notion of Green Information Systems supporting pro environmental behaviour, sustainable practices and

decision-making on the individual, organisational, and societal level (Henkel and Kranz, 2018).

However, the interdisciplinary nature of the topic is widely dispersed among different outlets (Henkel and Kranz, 2018). Therefore, the authors actively collaborate with experts and professionals from other disciplines, including management, computer science, engineering, environmental science, environmental psychology, and architecture (Seidel et al., 2017). Green Information Systems have due to this interdisciplinary nature different definitions. Table 6 presents the different definitions. Green Information Systems researchers have noted that sustainability complex nature has been addressed from various stakeholders and perspectives (Idrissi, Corbett and Laval, 2016).

Therefore, we assume some definitions have been influenced by these stakeholders and perspectives. Considering the definitions presented in Table 6, they have distinct perspectives on Information Systems. While the first and second definitions by Watson (2008, p.2) and Henkel and Kranz (2018, p.2) mention the interaction between Information Systems and Information Technology, the third definition focuses more on the environmental aspect. Therefore, we found the definition of (Boudreau, Chen, and Huber, 2008) to be appropriate for our paper, as it aligns our research objective and context.

Definitions of Green Information Systems	Author(s)
An information system (IS) is an integrated and cooperating set of software using information technologies to support individual, group, organisational, or societal goals	(Watson, 2008)
Green Information Systems encompass information technologies (IT), people, processes, and software to “support individual, organisational, or societal goals”	(Henkel and Kranz, 2018)
Improving the flow and management of information to support more environmentally favourable practices and decisions	(Boudreau, Chen, and Huber, 2008).

Table 6: Definitions of Green Information Systems

Looking at the similarities, these definitions have some relation to the widely adopted definition of sustainability by Brundtland commission “...*development that meets the needs of the present without compromising the ability of future generations to meet their needs.*” (Brundtland, 1987, p.8)

Moreover, it is important to establish the difference between Green Information Technology and Green Information Systems. According to Watson, (2008, p. 2-9), Green Information Technology refers more specifically to the infrastructure and hardware – and how this could be managed and designed from an environmental perspective (Idrissi, Corbett and Laval, 2016). Further on, (Watson, 2008.) argues that Green Information Systems has greater potential than Green Information Technology because it tackles a much larger problem by contributing to sustainable business processes. On the other hand, the author precises the importance of Information Technology because Information Systems are in need for Information Technology to operate.

As we now have established an understanding on Green Information Systems and the development, the next part will investigate how previous authors have measured the effects Green Information Systems have contributed on environmental sustainability.

Henkel and Kranz (2018) and Gholami et al. (2013), have a consistent approach when it comes to analysing the impact of Green Information Systems on environmental sustainability. They divide the effects into three categories. Firstly, decreasing consumption of natural resources of IT within the whole lifecycle (production to recycling). Secondly, Green Information Systems could help societies and businesses (e.g., manufacturing, logistics, energy, mobility). Lastly, “*Third order effects are systemic effects of Green Information Systems which lead to medium- and long-term changes of economic structures and behaviours towards more eco-effective practices*” (Henkel and Kranz, 2018).

These three effects are closely related to the three types of sustainability goals developed by (Hart, 1997). By reducing the amount of emissions, effluents, and trash, the first objective is to prevent pollution. The second, more important purpose is product stewardship, which aims to minimise the negative environmental effects of a product's whole life cycle while simultaneously reducing pollution. Utilising clean technology that generates no waste or harmful pollutants is the third and last objective (Watson, 2008.).

While the potential of Information Systems is acknowledged, it is also crucial to consider that Information Systems themselves add to the environmental sustainability issues in multiple ways. Recker, (2016, p.4474) mentions several ways. Firstly, Information Systems are contributing to environmental issues, such as consuming large amounts of electricity and putting stress on power grids, resulting in greenhouse gas emissions, which often goes unnoticed. Secondly, the hardware and software that make up Information Systems also cause major environmental issues during production, disposal, and usage.

2.3 The Role of Green Information Systems in Green Logistics

The previous section has presented an overview of the field of Information Systems and how Green Information Systems has progressed over time. As we aim to narrow down the literature devoting our research aim, we will examine how Green Information Systems have been implemented in the logistic sector. Before delving deeper, it is important to gain an understanding of Green Logistics and how Green Information Systems is applied within it.

Table 6 contains a selection of Green Logistics definitions. Overall, when compared to the definition of Green Information Systems, the four provided definitions are similar in that they all focus on the environment from various angles. The second and third definitions emphasise externalities, such as suppliers and consumers. On the other hand, the first and fourth definitions provide concrete examples of Green Logistics practices.

Definitions of Green Logistics	Author(s)
Green Logistics include supply chain management techniques and plans that minimise the ecological and energy impact of freight distribution, with an emphasis on handling materials, disposing of waste, packaging and transportation.	Rodrigue, Slack and Comtois (2017)
Green Logistics encompasses all aspects of managing the flow of goods and information in an environmentally friendly manner, from the point of origin to the point of consumption, with the goal of satisfying or exceeding customer needs.	Mesjasz-Lech (2016)
Green Supply Chain Management refers to an organisation's approach to incorporating environmental considerations into its supply chain management strategies, in order to improve the environmental performance of its suppliers and customers.	Lee et al. (2008)
Green Logistics activities involve evaluating the ecological impact of various distribution methods, minimising energy consumption in logistics operations, minimising waste and properly managing its disposal.	Sibihi and Eglese(2010)

Table 7: Definitions of Green Logistics

The issue of implementing "Green Logistics" has been progressively gaining attention in both the industrial and academic spheres, as noted by Lin et al. (2014). It is challenging to pinpoint the exact moment when scholars-initiated discussions on environmental issues related to logistics. However, the discourse on this topic gained more prominence after the year 1990, as noted by Islam et al. (2021).

According to Kumar (2015), there are two reasons which compel companies to green their logistic services; marketing demand and environmental concerns. Further on, the author elaborates on how findings show companies implement green practices just to enhance their public relations, and not help the environment. Table 8 illustrates the various environmentally friendly practices within the logistics industry, their effect on sustainability, and which practices mitigate negative impacts.

Practices	Sources which impact sustainability	Practices removing negative impact	Sources
Green Transport	The development of a transport network The operation of vehicles for transportation The disposal of transport vehicles	Modal choice Freight consolidation Clean vehicle/fuel efficiency Reuse of pallets and containers Standardisation of truck sizes	(de la Torre et al., 2021), (Wei et al., 2021), (Zhang et al., 2022), (Hu et al., 2015)
Green Warehousing	Layout, design, and capacity of the warehouse may impact the sustainability	Clean material handling equipment Process optimization Automatic warehousing systems Inventory minimization programs and just-in-time system Product disposition On-site recycling	(Ramos et al., 2014) (Lee and Chan, 2009),
Green Packaging	The elements of packaging which have an impact on warehouse and transport cost are size, shape and materials	To sort out the packaging issues, innovative packaging technologies and environmental certifications can be introduced	(Azzi et al., 2012) (Coelho et al., 2020)
Waste Management	Different kind of waste generated during the logistics like waste from expired product or due to packaging etc	Waste contractor Trade waste recycling	(Silva et al., 2017) (Fiksel, 2006).

Table 8: Green Practices in the logistic sector

Information Systems and Green Logistics are related in that they both positively influence value, quality and financial performance (Soo Kim and Narasimhan, 2002) (Lee and Lam, 2012) (Liu et al., 2008). To date, a number of Green Information Systems solutions have been presented which could support the practices mentioned in table 8, including Fleet Management Systems (Hu et al., 2015), Carbon Emissions Tracking Systems (Zhang et al., 2022), Energy Management Systems (Wei et al., 2021), Reverse Logistics Systems (Ramos et al., 2014) (Lee and Chan, 2009), Sustainable Transport Optimization Systems (de la Torre et al., 2021), Sustainable Packaging Systems (Azzi et al., 2012) (Coelho et al., 2020), and Sustainable Material Management Systems (Silva et al., 2017) (Fiksel, 2006).

We have previously shown how the literature defines Green Logistics, the various practices involved, and how Green Information Systems play a role in reducing negative environmental impact. In the next section, we will investigate leading sustainable concepts recent logistic companies have implemented.

In earlier research on Green Logistics, the value of Circular Economy and Reversed Logistics to the logistics sector was highlighted, as was the fact that less waste implies a more efficient business (Watson, 2008). Green Information Systems adoption might be motivated by concern for the planet, but the adoption must not affect the economy negatively (Gholami et al., 2013). However, literature on Circular Economy and Reversed Logistics has shown it possible to maintain sustainability and increase profitability (Khor and Udin, 2011).

According to Kirchherr et al. (2017, p.5), Circular Economy is defined as an economic system that replaces the 'end-of-life' concept by minimising, alternatively using, recycling, and recovering materials in production, distribution, and consumption processes. On the other hand, Sheu et al. (2002, p.2) defines Reverse logistics as the process of organising, executing, and managing the efficient and cost-effective movement of raw materials, in-process inventory, finished products, and associated information from the point of consumption to the point of origin, to recapture value or dispose of them properly.

Despite the advantages of the circular economy and reverse logistics, these concepts do have barriers. In a systematic literature review study (Govindan and Hasanagic, 2018), 39 barriers were identified and classified into eight categories. Based on the technological issues that information systems might experience, we identified three barriers. First, they discovered that timely or accurate information is not made available to decision-makers. Second, it's difficult to separate the materials. Finally, technological limitations by tracking recycled materials. Moving on to government issues, the authors mention the lack of standardised performance evaluation systems and recycling laws that do not produce high-quality products. Nonetheless, a study by Hart et al. (2019) demonstrates that technological and regulatory advancements alone are insufficient. It requires a transformation in business models and the behaviours and attitudes of stakeholders.

Figure 7 is developed by Khor and Udin (2011, p.3), and it shows how a move from linear to circular chain would increase the logistic needs – and possibly enhance profitability. It is also apparent that Circular Economy is a broader concept, and that Reversed Logistics is a part of it as a strategy.

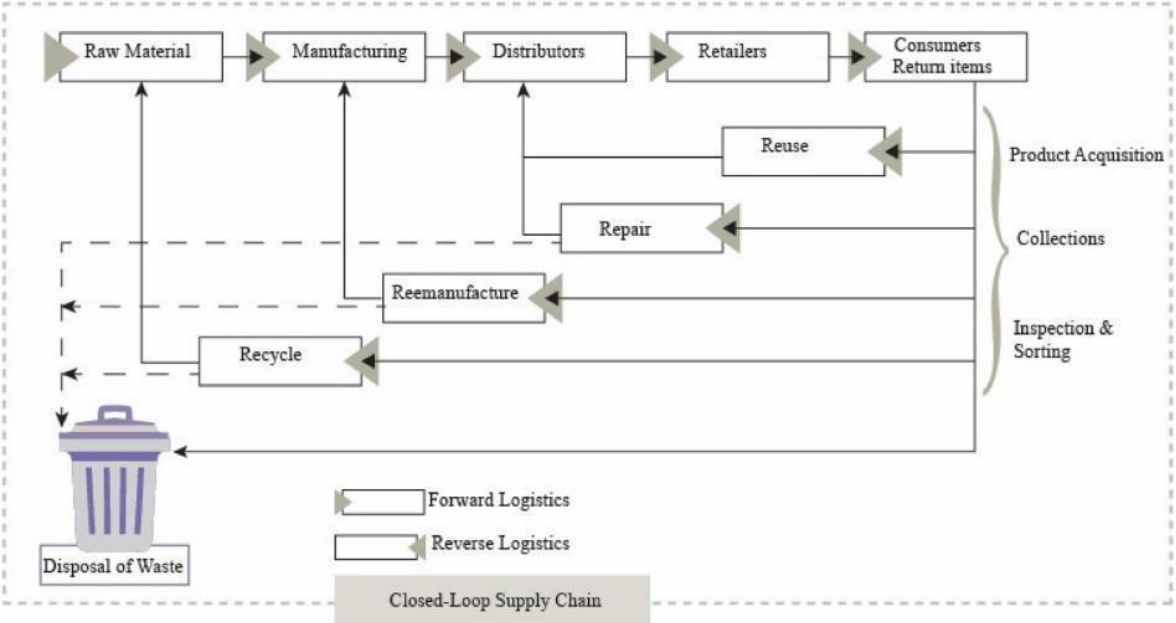


Figure 7: A generic form of the reverse and closed-loop supply chain in a single frame (Khor and Udin 2011 p 3)

2.4 Framework Analysis in Green Information Systems

This section will evaluate the strengths, weaknesses, and limitations of each framework that has been identified to establish a foundation for this thesis. This critical evaluation will provide a comprehensive understanding of the frameworks and help us determine the most appropriate framework to use in our study.

Five relevant frameworks were discussed. The Belief-Action-Outcome Framework was developed by Melville, (2010, p.4)– and it is adapting Coleman’s Micro – Macro Model (Alexander, 1987) and explicitly including the social and organisational contexts (Melville, 2010). The framework proposes that individuals' beliefs about a particular behaviour drive their actions, which in turn affect the outcomes of the behaviour (Melville, 2010). Some of the prior studies have used this framework to examining the role of Information Systems in enabling and transforming sustainable practices (Henkel and Kranz, 2018) , examine Green Information Systems integration for environmental performance (Anthony Jr., 2019), and employees collaborative use of Green Information Systems (Yang et al., 2017).

Moreover, in the context of our objectives, this framework can be used to understand how employees and managers believe that using these systems will impact the organisation and the environment, and how these beliefs influence their actions in adopting and using these systems. However, considering our research objectives, we want to investigate what impacts Green Information System practices have.

Moving over to a more classical framework, the Diffusion of Innovation Theory (DIT) was first introduced in the 1960s by Everett M. Rogers, (2008) and has been implemented in several studies within Green Information Systems. A research by (Moore and Benbasat, 1991) implies that researchers in Information Systems have begun relying on the theories with innovation diffusion to study implementation problems – and a major focus on users perceptions. For instance, Mustonen-Ollila and Lyytinen, (2003, p.278) investigated the Information Systems process innovation adoptions.

The framework proposes that the adoption of innovation is a five-step process, including knowledge, persuasion, decision, implementation, and confirmation (Rogers, 1995). Keeping our objectives in mind, this could investigate from a more specific purpose on understanding the process of adoption of Green Information Systems – and the factors that influence managers and employees to adopt and use these systems. The model is considered

to be well established and used in information technology diffusion-related research (Prescott and Conger, 1995). However, we argue it does not fully appropriately fit in our research aim.

Theory of Planned Behaviour (TPB) is the following classical framework. It examines the relationship between a person's attitude, subjective norms, perceived behavioural control, and intention to engage in a certain conduct (Conner and Armitage, 1998). It aligns with our objective as it could investigate the behavioural lens on understanding which factors influence the managers and employees to adopt and use Green Information Systems. On the other hand, Conner and Armitage (1998, p.1440) also reflect upon how it could identify the barriers to adoption. TPB takes into account both cognitive factors (e.g., attitudes and subjective norms) and behavioural factors (e.g. perceived behavioural control) in addition to intentions, which is more suitable for understanding the adoption of Green Information Systems by managers. We argue that this may move the discussion outside our research aim as it has more focus on the behaviour lens rather than identifying the practices..

Another theoretical framework is The Technology Acceptance Model (TAM), it explains how individuals evaluate and adopt new technologies. According to Davis, (1985, p.15), attitude towards a technology is a key determinant of usage behaviour. The model consists of two key constructs. Perceived Usefulness (PU), the first component, is defined by Davis, (1985) as the extent to which a person thinks utilising a technology will improve their life or job performance. Secondly, we have Perceived Ease of Use, and the degree to which an individual believes that using a technology is easy and convenient.

From a managerial and employee standpoint, the model also enables us to analyse and assess the influence of social influence on the adoption and usage of Green Information Systems. On the other hand, it is important to consider the model's limitations and weaknesses. Firstly, the limitation of the scope which focuses on the individual perception – and not fully address other factors that might influence the adoption and usage. Secondly, Davis (1989) reflects on the need for further research to understand why some performance beliefs differ from objective reality.

In addition to the five frameworks mentioned, we also have the triple bottom line (TBL) framework, which is also relevant to our objectives. This framework was developed by (Elkington, 1998) and presents three key dimensions of sustainability: economic, environmental, and social. According to the author, it implies that businesses must evaluate

their success by considering not only their financial performance but also their effects on the society and environment.

The framework presented is highly relevant to our research goals in the field of Green Information Systems. By utilising this framework, we can angle our research to investigate how Green Information Systems is adopted and practised by managers in these three relevant areas, and give a clue on how Green Information Systems have impacted the logistic sector.

The idea behind the Triple Bottom Line is that a successful company is not only measured by its financial success, but also its relationship with the social and environmental aspects. This idea is well accepted, since the stakeholders play an important role in how the company should behave. However, the main criticism of this framework is that there are no tools yet capable of measuring social and environmental performance so they can be compared and used as a form of evaluation of the impacts these companies have in these three segments (Norman and MacDonald, 2004).

Although much of the usage of the term Triple Bottom Line is synonymous with cooperative social responsibility, that is exactly what we want to investigate but having Information Systems as the main responsible for these impacts. In addition, the framework could assist us in evaluating the effectiveness and competitiveness attained through the incorporation of Green Information System practices in the logistics industry, which is a central focus of our research.

In the following chapter, we will delve further into this chosen framework for our thesis, discussing its relevance to our objectives and making any necessary adaptations.

2.5 Summary of Literature Review

An overview of the main themes discussed in this chapter is given in Table 9 below.

Themes	Presented	Dissertation focus
<i>1: Green Information System Definitions</i>	<u>Three identified definitions:</u> The definitions are presented in the literature - and can be seen in Table 6. They were all traced back to the widely adopted definition of sustainability - but provided different perspectives on Information Systems.	Definition: “Improving the flow and management of information to support more environmentally favourable practices and decisions”
<i>2: Green Information systems and practices in the logistic sector</i>	<u>Four practices identified:</u> Green Transport, Green Warehousing, Green Packaging, and Waste Management. <u>Seven Green Information Systems:</u> Fleet Management Systems, Carbon Emissions Tracking Systems, Energy Management Systems, Reverse Logistics Systems, Sustainable Transport Optimization Systems, Sustainable Packaging Systems, and Sustainable Material Management Systems <u>Two concepts identified:</u> Circular Economy and Reversed Economy	Examine how these identified practices, concepts, and systems are tied in the case company
<i>3: Theoretical Frameworks</i>	<u>Five selected frameworks:</u> Numerous framework exist within the Information System field - however due to lack of research on Green Information Systems, few frameworks have been adopted and built upon in this field.	The Triple Bottom Line (TBL) framework as a supportive theoretical lens for analysis

Table 9: Our literature review summarised into 3 main themes.

Table 10 provides an overview of the primary literature and identifies an absence of articles focusing on Green Information Systems within logistics.

Articles	Green IS	Green Logistic	Green Information Systems in the context of Green Logistic	Method of using GIS in logistics	Literature review of GIS practices
(Ren et al., 2020)	✓		✓		✓
(Srivastava, 2007)	✓		✓		✓
(Anthony Jr, 2019)	✓			✓	
(Henkel and Kranz, 2018)	✓			✓	✓
(Brooks et al., 2010)					✓
(Dao et al., 2011)	✓				
(Gholami et al., 2013)	✓				
(Seroka-Stolka and Ociepa-Kubicka, 2019)		✓			
(El Idrissi et al., 2016)	✓				✓
(Watson, 2008.)	✓	✓	✓	✓	✓
(Lin et al., 2014)		✓	✓		
(Loock et al., 2013)	✓				✓
Sum:	9	3	4	3	7

Table 10: Overview of the main literature used in this dissertation.

We will outline our method for responding to our research question in the next section.

3. Method

In the previous chapter we addressed “what” the object of study is, while this one, we cover “how” we will answer our research question. Furthermore, highlighting the philosophical foundation of the research and how the research design was chosen - what the plans were and procedures explaining each step and giving details about the methods of data collection and analysis, the chosen strategy to integrate the different aspects of the study to answer the research question (Tharkur, 2021).

Choosing the correct research design is complex but important. Since there is always a history to be told, whether by a causal explanation, or a description of an observation, or a narrative of an experiment. Nonetheless, it requires us to reflect on the phenomena we are investigating and how we are going to do it (Takahashi and Araujo, 2020).

3.1 Choosing the Research Design

After studying the topic and constructing the literature review, it was easy to see that there are many questions without answers when it comes to Green Information Systems and how it is applied in the post/logistic sector. It is not well defined whether managers understand the role of Information Systems inside sustainable business practices, how they plan and work around the present environmental concerns, what are the main contributions of Information Systems to the environment and where it thrives the most generating economic growth.

It is important to highlight value creation in business to encourage more companies to follow the steps of Green Information Systems. Empirical studies show that the quicker a company adapts to changes in a dynamic capability way, the more likely it is to gain in competitiveness (Li and Liu, 2014).

3.2 The TBL Framework as a theoretical lens for analysis

A framework analysis was undertaken in section 2.4, where numerous frameworks were introduced and their applicability to our study issue was explored. Our theoretical lens for the analysis will be the TBL framework. Elkington (1998) formed the triple bottom line framework, which outlines the economic, environmental, and social sustainability factors. It suggests that companies must evaluate their success by considering not just their financial performance but also their effects on society and the environment. Integrating sustainable values and practices will not give a company short-term profits, and thus need to look at how

it will benefit the company in the long term (Bocken et al., 2014). This transformational approach of the TBL, requires new thinking (Boons and Lüdeke-Freund, 2013)

Recent studies have retested the validity and reliability of the model, and have concluded its relevance today (Svensson et al., 2016), (Laurell et al., 2018). Moreover, the study conducted by (Laurell et al., 2018) tested the framework in European countries (i.e. Norway and Sweden) and have also confirmed its validity. However, these studies have not been applied within the Green Information Systems field.

According to (Savitz and Weber, 2014), businesses are seeking the sustainability sweet spot. An area where pursuing profit and pursuing the common good, both environmentally and socially. Further on, they reflect upon how the benefits could result to efficiency gains, business growth, and innovation as illustrated in Figure 8.

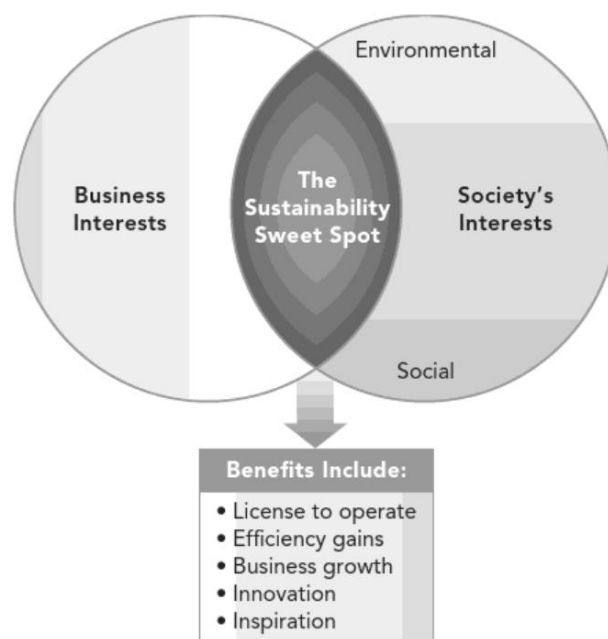


Figure 8: The Sustainability Sweet Spot (Savitz and Weber, 2014).

3.3 Case Study and Research Method

Case studies is pointed as the most common qualitative method used inside Information Systems (Meyers, 1997). On the other hand, they are not simple to define as many other research methods because of its nature. According to Pickard (2007) it can be defined as the process engaged in investigating a phenomenon and/or also the written result of

that investigation. This method has been used in a broader context than appropriated and the definition of case study has become rather blurred (Stake, 1994).

Among the researchers, Yin (2008. p.23) has the most used definition to what a case study is as:

“An empirical enquiry that investigates a contemporary phenomenon within real-life context; when the boundaries between phenomenon and context are not clearly evident; and in which multiple sources of evidence are used.”

Yin in 2014 also points out that the more your research question tries to explain “how and “why” in a phenomenon, it is a good indication for a case study. It has been a common research method in business, also in economics, when we need to investigate a given industry. Following his book, we gathered some common concepts that describe what a Case Study is. In the table below we describe them with their corresponding meaning to our study.

Case Study Characteristics	Description
Contemporary Phenomenon	Urgency of environmental concerns, recent advancement in Green Information Systems and pressure on the logistic sector by stakeholders.
Complexity	Find the main applicabilities of Green Information Systems inside the road logistic sector, finding gaps and where value is created.
Real-world context	Investigating the main logistic companies in Norway.
Research question	RQ: " What are the impacts of Green Information Systems on the post/logistics sector in Norway?"
Case Study Design	Single-case design
Case Study Type	Exploratory
Sources of Evidence	Interviews and observations
Participants	Managers and employees of the Road Logistic sector in Norway

Table 11: Criteria for Case Study. Adapted from Yin (2014)

3.3.1 Focus and Boundaries

Identifying the field is a process where we draw boundaries around the research context, revealing the researchers ontological and epistemological assumptions (Denzin and Lincoln, 2005).

Figure 9 displays our focus, represented by a “heart” of the study, where the dotted circle defines the boundaries of our case.

For this case we will analyse the impacts of Green Information Systems inside the post/logistic sector. However, our object of study is mainly the operations inside the warehouse and the process of distribution that comes after it.

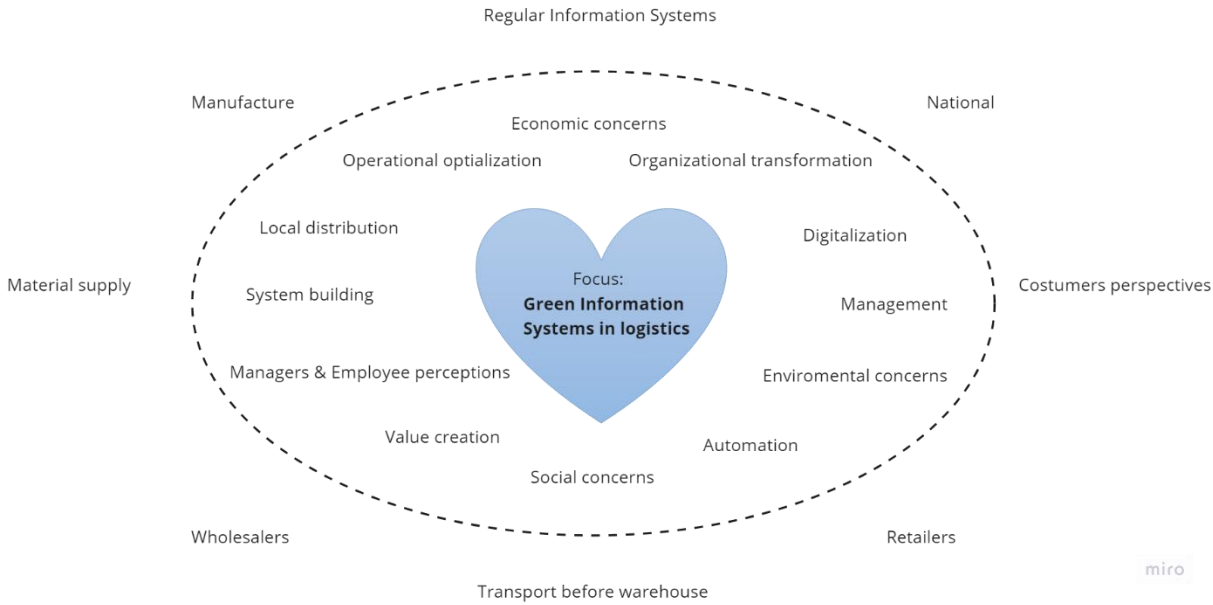


Figure 9: Our case study focus and boundaries adapted from Miles and Huberman (1994, p.25).

3.3.2 The Case Company

An important Norwegian postal and logistics corporation is the subject of this investigation and requested anonymity regarding their identity. The company has about 12500 people spread across four countries, with the majority working in Norway, followed by Sweden, Denmark, and Finland. It has been in business for over 100 years. The logistics company is a market leader and has led in recent years in terms of consumer preferences, innovation, technology, and environmental goals.

They divide their operations primarily into the two services of logistics and post. Started primarily with postal services, the business has undergone a change and now devotes 80% of their services to logistics. The corporation has various warehouses spread out over the nation. However, we will mostly investigate their biggest warehouse in this thesis. Figure 10 illustrates their value chain in relation to the warehouse. This is our primary emphasis, highlighted in red.

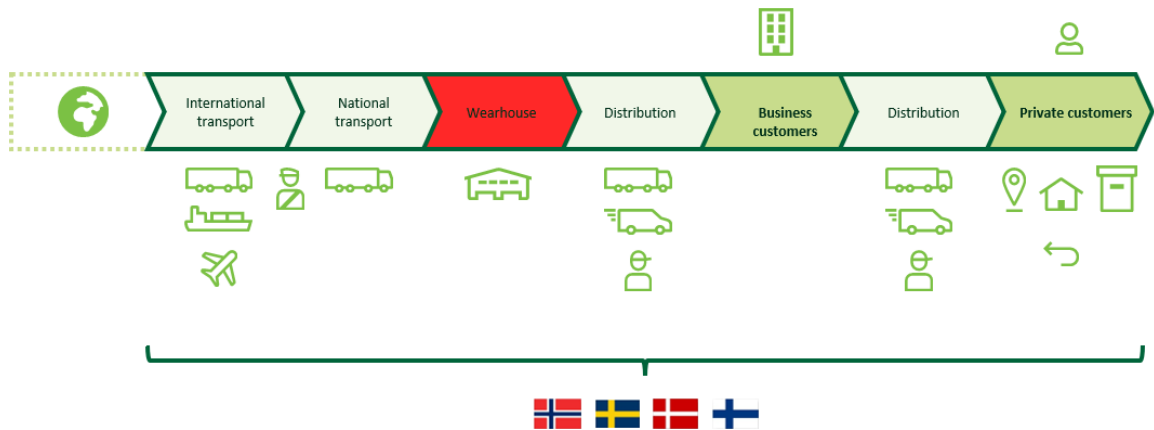


Figure 10: Internal supply chain pipeline. Translated from Company's own archive.

3.3 Data Collection

In this study, a series of interviews were employed as the main tool of our qualitative research. The participants were carefully selected from strategic departments and positions as we will discuss in the sections below.

3.3.1 Sampling

Sampling is commonly used since it is practically impossible to use a whole population in a study. When it comes to a qualitative study, the sample is selected based on what we can learn from the case and usually the goal is not to make assumptions or generalisations about the population. It is to perform an in-depth research indicating as a rule of thumb that qualitative research usually tend to use purposive sampling - selecting information-rich cases where one can learn important things that are directly connected to the purpose of the research (Patton, 2002).

We used the snowball sampling approach where we first contacted a key manager inside the leading company in the industry and let him point out further issues and inquiries that needed further investigation. This key manager has 14 managers under his hierarchy, we had the opportunity of direct access to their expertise. After this initial approach we were able to perform 8 interviews of the leaders. Then, we decided to direct our interviews to their employees to try to confront their ideas. Hereby, performing 14 interviews, two from each department.

The main goal for such a procedure is to create validity in the analysis (Yin, 2014), targeting the problems from different angles. Although most of the interviewees were men, it reflected proportionally the total population which is mainly dominated by men.

3.3.2 Interviews

According to Oates, (2018 p.187), interviews are frequently used in case studies. It is a good method for generating data for obtaining detailed information, asking questions that should be moulded to different people depending on their roles, exploring experiences and information that could not be obtained otherwise. The type of interviews performed were semi-structured, where we set a list of themes to be covered and had a set of questions to be asked.

However, different from structured interviews that follows a strict protocol, the order of our questions was changing depending on the course of the answers and some additional questions were arising if new subjects would come out of the answers. The interviewers were also encouraged to bring issues of their own that we did not ask about, both during the interviews as after when sending to them the transcriptions. This approach is deemed fitting to this study, due to the gaps on Green Information Systems in the road logistic sector, finding almost no data related to the subject.

The interviews were conducted considering the Triple Bottom Line framework by Porter and Kramer, 2006, divided by three main topics: economic, social, and environmental aspects.

After setting aside most relevant questions we should ask, we did a pre-test and interviewed the participant with a broader overview inside the company to adjust the course of the interview with more efficiency. After this first interview, we learned about who had most knowledge about the Information System tools and processes used in the company towards sustainability. Thereby, we received a good indication of what to expect from each participant adjusting the time for each question accordingly.

We followed Oates, 2012 guidance for interviewing and transcribing, starting the interviews with an introduction about ourselves and the theme we wanted to cover. All the questions were easy to be understood, not too long or too short, in some cases a scenario was described to illustrate what we meant. The questions also had the aid of prompts, probes, and checks, repeating the questions if necessary, asking for further examples and deeper

explanations or repeating some answers to validate if what we understood was correct. The last one was one of the most important tactics utilized since we did not record the interviews.

The transcriptions were made as soon the interviews were finished, to secure detailed transcriptions while still fresh in our memories. After that, we sent an email for each interviewer to confirm if what was said was correct, if they wanted to remove or add anything and if they approved the utilisation of their answers to this study.

We did consider performing direct observations, since they can provide evidence to explain the “here” and “now”. However, it needs to have a form and structure since casual watching is probably not going to lead to any strong evidence (Pickard, 2013). After our second day at the company, we understood that very little useful information could have been taken from those observations, so we kept to the interviews investigation.

Sources of Evidences	Data sources and characteristics	Data	Participants
Semi-structured Interview	Pre-test with the District Manager	Text	1
Semi-structured Interview	Managers from different departments inside the post/logistic sector	Text	7
Semi-structured Interview	Different employees inside the road logistic sector	Text	14
Documents	Trainee brochure with overview of companie's operations	Text	1
Total Participants			22
Total Documents			1

Table 12: Summary of our data collection

3.4 Ethical Considerations and confidentiality

The data collection was conducted with ethical considerations in mind. The participation was voluntary, they were informed about the purpose of the study, their names are kept anonymous and all private information is strictly confidential. The interviews were not recorded and after each interview its transcripts were sent to the interviewee that had free choice to add, remove or withdraw some or all answers before consenting us to use them in this study.

3.5 Data Analysis

To analyse the data collected by the interviews and documents we used the ladder of analytical abstraction from Carney, 1990 cited by Miles and Huberman, 1994. It shows a ladder with three main steps to be performed. These kinds of diagrams are used to show the progression in each step, that will be the basis for the next one (Verdinelli and Scagnoli, 2013)

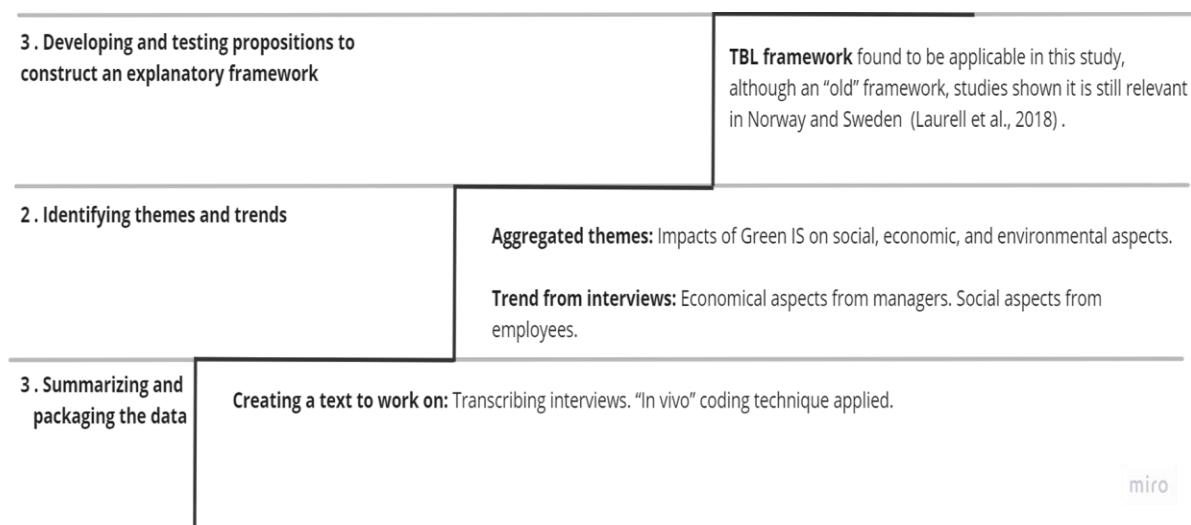


Figure 11: Our adapted Ladder of Abstraction from Carney 1990, cited by Miles and Huberman 1994, 94)

3.5.1 Summarising and packaging the data

At this stage the goal is to create a text to work with. As soon the interviews were done, we made annotations with a summary of the most important aspects and subjects presented to us. The transcripts were made right after and sent to the interviewees for review and approval of the answers. “In vivo” codes with the most repeated phrases were collected showing clear patterns from the informants of each group.

3.5.2 Repackaging and aggregating the data: finding themes and trends.

After finding relevant codes we separated them by themes, using the main topics of our conceptual framework - the triple bottom line. The codes were set on a table and the themes represented by different colours to make the process of classifying their importance easier, as shown in appendix 9.20.

3.5.3 Constructing a framework: developing and testing propositions.

For this step, it is necessary to cross-check tentative findings, make a matrix analysis of major themes and integrate the data into one explanatory framework. The findings were compared with the main aspects of the triple bottom line which required a deeper work, but generated contributions to both a theoretical and practical contribution, further explained better in the contributions chapter.

3.10 Summary of Methods

In this chapter we explained how we chose our research design and gave argumentations to support our decision to choose a case study. The theoretical lens was presented, utilising the Triple Bottom Line (TBL) framework as main areas for the topic interviews. The case company is described, also the tools of data collection and the approach for sampling. Furthermore, the ethical considerations were described in accordance with Kristiania's guidelines.

4. Findings and Analysis

In this chapter, findings will be presented from this qualitative case study. Specifically, the study focused on identifying the areas in which Green Information Systems

has been applied, as well as understanding how managers and employees perceive and adopt Green Information Systems.

To achieve these objectives, we conducted in-depth interviews with eight leaders from one of Norway's largest mechanical terminals, who were selected for their knowledge and experience in post/logistics and sustainability. Each interview lasted approximately 40 minutes. Then 14 more interviews were performed, selecting two employees from each department to confront our findings.

Before we began the interviews with the employees, we were given a tour of the terminal as well as the different departments that make up the company. This helped us gain valuable context and insights into the business operations and work environment of the company. The data collection process involved the utilisation of a semi-structured interviewing technique. The arrangement of this section will be founded upon the topics outlined in the interview guide.

4.1 Participant background

This section presents an overview of the interview subjects and provides context to their answers. The participants were divided in two groups, the first group - the leaders, was composed of 8 managers at one of Norway's largest mechanical terminals, with varying degrees of responsibility for managing different departments within the organisation. The sample included seven male and one female participants, reflecting an unequal gender balance, but did not affect the validity of the results. It was explained by one of their recruiters that most men in their group reflected the lack of women looking for jobs in the post/logistic sector. Moreover, the participants' ages ranged from 26 to 63 years old, with a mean age of 41 years.

Moving to the demographic characteristics listed below, the participants had an average of 19 years of experience in the logistic sector, with a range of 8 to 43 years. They also had an average of 11 years of leadership experience, with a range of 1 to 31 years. The participants represented different departments within the organisation, and were responsible for managing teams of varying sizes, where the leader with fewer employees under his responsibility was leading 30 employees to the district chief leading about 530 employees.

The second group - the employees, was composed of 14 employees, two from each department, in a total of 11 males and 3 females. Their age was inside a range of 19 to 61

years old, with a mean of 33. In contrast, the logistic experience ranges from six months to sixteen years, with an average of eight years.

The information from the interview questions, which were on the subjects' backgrounds and current roles, is summarised in the two tables below according to their categories:

Group A: The Leaders.

Participant	Gender	Years of experience in logistics	Department
Leader 1	Male	16	Operational Chief
Leader 2	Male	30	Deviation
Leader 3	Male	43	Operations Close Support
Leader 4	Male	23	Shipping
Leader 5	Female	7	Local Postal Operations
Leader 6	Male	11	Technical
Leader 7	Male	8	Main Postproduction
Leader 8	Male	12	Production

Table 13: Summary of the background of the participants from group A (Leaders)

Group B: The Employees.

Participant	Gender	Years of experience in logistics	Department
Employee 1	Female	0.5	Deviation
Employee 2	Male	3	
Employee 3	Male	5	Operations Close Support
Employee 4	Male	9	
Employee 5	Male	8	Shipping
Employee 6	Male	13	
Employee 7	Female	8	Local Postal Operations
Employee 8	Male	6	
Employee 9	Male	9	Technical
Employee 10	Male	4	
Employee 11	Male	7	Main Post production
Employee 12	Female	5	
Employee 13	Male	13	Production
Employee 14	Male	16	

Table 14: Summary of the background of the participants from group B (Employees)

4.2 Green Information Systems and Sustainable Economic Growth

The interviewees were asked about their familiarity with Information Systems, how they used it to achieve sustainable objectives, and to provide examples of how Green Information Systems influenced the expansion of their business. Before beginning the queries, we provided a brief definition of Green Information System so that participants would have a greater understanding of the topic.

Group A (the leaders) participants all claimed to have some level of familiarity with the company's Information Systems. Four individuals reported having an intermediate level of comprehension, while the remaining four claimed to have advanced knowledge. They appear to have a fundamental understanding of Information Systems and their potential post/logistics applications.

“I would say that I am well acquainted with the systems we got specialised with inside the fields we are working at. As an example, we have a PDA scanning system that gathers all the information, so the worker does not need to memorise everything anymore. Anyone can perform the job and the customer can track the shipments at the same time.”

-Leader 7

In contrast, there are certain knowledge gaps between our employee participants and the leaders when it comes to information Systems. In general, Group B (the employees) were not familiar with the systems, but provided examples after we described what it was. Most employees claimed that they understood very little about the existing Information Systems systems used in the company and that they were only familiar with the Information Systems from the devices they had in their departments, not knowing much about what was used in other departments, although most of them seemed open to learn about them.

“To be honest, I do not have a deeper understanding on how these systems work. My familiarity with the systems extends only upon the systems we use near my workplace. However, I am willing to learn more about these systems and expand my knowledge in this field.”

- Employee 13

Regarding the leaders' perspective, four participants possessed an in-depth understanding of Green IS, four had some experience with it, and the remaining two had only a basic understanding. Those with in-depth knowledge of Green Information Systems stated that the company had developed its own internal systems, some of which were more complex and some of which had to be modified to be more user-friendly, as stated by participants 1 and 6.

"I would say that I am very familiar with Green Information Systems and the systems we use in general, that could be all of our management systems tools such as SAS and other internal systems that the company has itself designed(...) after a long internal discussion, we ordered a system from China, but the drivers did not know how to use it, so we had to change them to iPads where they bring in the truck and have access in real time to the shipments log."

-Leader 1

"I've become more and more familiar with our systems and technology over the years. We have for example: systems for registration, follow-up, "LM", "KOS", and other internal systems we have designed."

-Leader 6

In contrast to the findings of the leader group, respondents from the employee pool demonstrated generally limited knowledge of Green Information Systems. Eight out of fourteen participants exhibited no or limited knowledge of green information systems and their application in the workplace. For instance, participants 6 and 9 were unable to differentiate between Information Systems and green Information Systems. In addition, participants 4 and 2 reported familiarity with green IS, but conveyed the concept using generic Information System terms.

"I don't know anything about Green Information Systems. Even if your examples may have helped convey the idea, it is important to realise that not knowing or understanding a subject can make it hard to properly understand all its complexity."

- Employee 4

Participants were asked to offer examples of Green Information Systems that impacted their department's economic development and sustainability. Investigating the leaders, they recognized PDA scanners, the LMK and KOS systems for package information monitoring and strain reduction, the Auto Loader system for production efficiency, and EURO 6 motor-equipped vehicles with emission tracking systems. It is found that Green Information System practices had a higher impact on economic growth than sustainability. Most of the examples include efficient systems that have improved production, efficiency, and cost. These efforts unintentionally led to sustainable growth, showing a link between efficiency and sustainability.

"I would say the most resourceful systems we use are the ones that give us forecasts. These systems allow us to be able to plan accordingly, so that we use the right resources against the right volume. For example, we are able to map the use of the right number of employees, so we can adequate it to the correct amount of work, and also the right number of cars used to deliver and optimise the trips."

-Leader 1

"I would say it's the system called Data Driven (Data Drevet). This is the one we are using with a great financial gain. Before this system, the employees had to remember all the postcodes – now everything is inside the system. Anyone can perform the job with one click. Here we save money on training – at the same time as we can quickly hire substitute workers more frequently."

-Leader 5

"In our department, for example, we have a system where we register the various jobs we perform. In this way, we are able to follow up the work, look at developments and trends. The systems give us the ability to take out streaming data, load new information like prices of various parts etc. Furthermore, we have also developed QR codes on the various parts so that

we can scan these parts and load their info into the system. In this way, we also have automated most of the work in our warehousing."

-Leader 7

Conversely, the employees who had a limited to moderate understanding of green information systems provided us with analogous systems to those mentioned by the leader interviewees. Participants 12 and 14 provided examples of the systems that had the greatest impact and were most frequently utilised. The individuals clarified the effects of the PDA system on temporal and financial economies and expounded on the enhanced efficiency and efficacy of their work shifts facilitated by the Data Driven system.

"For me it's PDA scanners. I wear a glow and a PDA scanner. I assume that the company saves money by decreasing staff by scanning packages quickly."

- Employee 7

Further on, the decreasing staff requirement was also pointed out by Employee 12 with another angle.

"After installing these forecasting systems, the company can monitor daily delivery arrivals. We used to work on-call with erratic hours before this system. The system provided me with the chance to qualify for a permanent position."

- Employee 12

The two tabular representations below present a concise overview of the viewpoints of the leaders and employee's respondents regarding the use of Information Systems in promoting sustainability and economic progress. High is denoted by the colour **Green**. **Yellow** denotes medium, while **red** denotes low.

Interestingly, the leaders had a considerably better comprehension of these systems than the employees. They also presented further instances of Green Information System practices. On the other hand, they both seemed to agree that the systems have a greater impact on financial development rather than sustainability.

Participant	Familiarity with Information Systems	Familiarity with Green Information Systems	Example of Green Information System practice	Impact on financial development	Impact on sustainability
Leader 1	Very Familiar	Very Familiar	Forecasting systems to optimise resource use.	High	High
Leader 2	Somewhat Familiar	Somewhat Familiar	Tracking system to show green routes.	High	Low
Leader 3	Somewhat Familiar	Somewhat Familiar	Invoice systems, customs clearance systems, and sorting systems that enable more efficient use of resources, reduce waste, and minimise environmental impacts	High	High
Leader 4	Very Familiar	Very Familiar	Digital inventory management system, Emission tracking systems, and GPS tracking systems.	Medium	High
Leader 5	Somewhat Familiar	Somewhat Familiar	Logistics and Supply Chain Management Information Systems to scanning and sorting.	High	Low
Leader 6	Very Familiar	Very Familiar	Logistics and Supply Chain Management Information System to manage their part inventory as well as track and monitor job progress.	High	High
Leader 7	Very Familiar	Very Familiar	PDA systems to allow customers to track shipments.	Low	Low
Leader 8	Very Familiar	Somewhat Familiar	Time and attendance management system and Warehouse management system to track movement of goods.	High	Low

Table 15: Summary of leader’s perspectives on the “Green Information Systems and Sustainable Economic Growth”.

Participant	Familiarity with Information Systems	Familiarity with Green Information Systems	Example of Green Information System practice	Impact on financial development	Impact on sustainability
Employee 1	Not Familiar	Not Familiar	Tracking System	High	Low
Employee 3	Somewhat Familiar	Not Familiar	Forecasting system	High	Low
Employee 5	Not Familiar	Not Familiar	Route Optimization Systems	High	Low
Employee 7	Somewhat Familiar	Somewhat Familiar	Scanning System	High	High
Employee 9	Very Familiar	Very Familiar	Energy Efficiency System	High	High
Employee 11	Not Familiar	Not Familiar	Warehouse Management Systems	High	High
Employee 14	Somewhat Familiar	Somewhat Familiar	Warehouse Management Systems	High	High

Table 16: Summary of Employees perspectives on the “Green Information Systems and Sustainable Economic Growth”.

4.3 Perception and Adoption of Green Information Systems

To assess their views on Green Information Systems, participants were asked how they thought about sustainable efforts. All leaders and employees supported Green Information Systems. Participants 2 and 8 from the leader group show a recurring theme: Technology and innovation interest some responders.

"I have a positive attitude towards Information Systems as we are primarily involved in developing our own systems and automatizations. This leads to easier acceptance and use for us."

-Leader 2

"I have a positive attitude towards these systems and the company in general also has an welcoming attitude for new initiatives and innovative solutions."

-Leader 8

Moreover, a reoccurring trend apparent from the leaders' transcripts, is the recognition of the benefits linked to the implementation of Green Information Systems. These systems, when utilising high-quality data, have the potential to enhance performance and increase efficiency, resulting in improved task execution and workflow.

"Have a positive attitude towards this as soon as the quality of the data is good. By quality, I mean whether the data is accurate. The design of the system and how it's user-friendly is just a plus."

-Leader 1

"I am very positive about these systems as they have made our everyday life much better. We went from being chaotic to having structure after implementing these systems."

-Leader 6

"I am very positive about this as I feel it both develops the company and my team towards better results."

-Leader 7

Additionally, the employees demonstrated a significant level of gratitude towards these systems. All 14 employees expressed a high level of trust in the utilisation of these systems, citing its positive impact on their work's effectiveness and efficiency. Employee 7 and 8, as well as 11 and 12, provided illustrations of the enhanced efficiency resulting from the utilisation of PDA-scanners during the sorting and scanning of packages into distinct cages. Employee 8 emphasised that prior to the implementation of the new systems,

employees were compelled to take breaks from their work by result of stress of committing all postcodes to memory.

"I am very optimistic about these systems, and I have also decreased my stress levels." Previously, I had to memorise all the postcodes as well as the cage number to which they were assigned. Now I'm just a scan away from figuring out where to put the package."

-Employee 14

Following this, the respondents were surveyed regarding the decision-making procedures of the enterprise, which aims to attain equilibrium among economic, environmental, and social considerations, with a concentration on the triple bottom line model.

Regarding this matter, the leaders provided a range of responses. The first participant expressed that their organisation places emphasis on social factors when making decisions but acknowledges the potential for this prioritisation to be subject to alteration based on situational factors. The decision to construct a new terminal in proximity to Moss had significant implications for the economy, employment opportunities, and environmental factors, necessitating difficult compromises.

"I feel like our organisation puts the social aspects first when we make decisions. Now I occupy a position where we can't just think about one isolated aspect – but again, this is very situational. For example, if technology were to emerge that replaces humans, it would require tough decisions. We are getting a new terminal at Moss, and this is close to Sweden. The decision of the location of this terminal affects both the environment making the process more efficient, the social creating job opportunities in the area and the economic aspect, where we save money by cutting costs."

-Leader 7

According to Participant 6, the organisation considers three aspects to be crucial and interrelated components of a golden triangle. The process of decision-making is subject to the

influence of various components, and the equilibrium among these components may undergo changes in response to the needs of the organisation.

Participant 1 provided an example of how the implementation of technology, such as automation resulting in the replacement of five employees, would not necessarily lead to job losses. Instead, the company could consider the social implications and plan accordingly by reducing their workforce and gradually transitioning employees to different positions, thereby avoiding the need for layoffs.

"If we take a further example where there is a technology that, for example, removes the need for five employees. First and foremost, technology won't cause the five employees to lose their jobs at once. Our company will highlight social concerns and allocate them to new jobs instead of recruiting new people to the other sectors that will increase with the higher productivity after the automatization."

-Leader 1

Regarding the viewpoint of the leader, Participant 5 expressed appreciation for the initiatives undertaken by their organisation to tackle social and environmental concerns. Specifically, they praised a proposal that involves the offer of mail delivery services and visits to the elderly. Moreover, the implementation of electric power in their vehicle fleet is aimed at reducing their carbon emissions and mitigating environmental impacts.

"...we can consider an example the company is working on now. Here we are working on a solution where you can deliver mail and visit the elderly. In this way, the social is taken care of. We also think about the social pressure from customers to be sustainable, in this regard we are working with the electrification of our car fleet. Here we have already replaced a good number of cars with EL solutions – and are still working on electrification of the trucks and hopefully in two years at least 90% of our entire fleet will be electric. The goal is to be 100% though"

- Leader 5

-

Examining the employees' transcripts, it was found that the predominant response related to the social factor and its impact on their job because of the mentioned

implementations. Particularly in the responses provided by personnel operating in departments such as Local Postal Operations and Operations Close Support.

Prior to the implementation of the systems, these departments required an increased physical workforce. During the implementation period, Employee 14 expressed worry regarding the possibility of losing their job. Employee 2 and 5 emphasised the company's provision of internal training and development opportunities. The employees were subsequently transferred to a different location and did not experience job loss.

“I have now been with this company for 12 years. During these years, we have implemented new systems in our department. Some of the systems have eliminated the need for human interaction due to automation. While automation may have removed the need for human interaction in some areas, it has also created new job opportunities and improved efficiency in other areas, ultimately benefiting the company.”

- Employee 14

All participants supported efforts to promote Green Information Systems. Three main patterns were discovered. First, how they viewed changes in efficiency and outcomes. Second, how the company creates and modifies its own systems. Thirdly, they highlighted systems' capacity for transformation.

Table 17 and 18 summarise how participants prioritise the three components of the Triple Bottom Line. High is denoted by the colour **Green**. **Yellow** denotes medium, while **Red** denotes low. Figure 12 and 13 further illustrate the findings visually.

Participant	Economic Concerns	Environmental Concerns	Social Concerns
Leader 1	High	Medium	High
Leader 2	High	Low	Low
Leader 3	Balanced	Low	High
Leader 4	High	High	Low
Leader 5	High	Medium	Medium
Leader 6	High	High	High
Leader 7	Low	Low	Low
Leader 8	Medium	High	Low

Table 17: Summary of leader's perspectives on attitude towards green Information Systems initiatives in logistics operations

Triple Bottom Line: Managers' perception

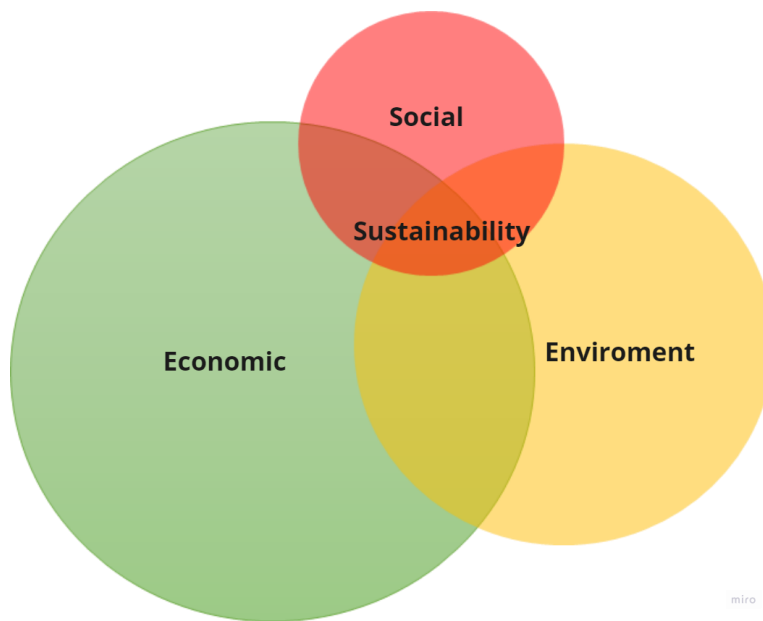


Figure 12: Leaders' Perception applied to the Triple Bottom Line.

Participant	Economic Concerns	Environmental Concerns	Social Concerns
Employee 1	Medium	Medium	High
Employee 3	Low	Low	Low
Employee 5	High	Medium	Medium
Employee 7	Medium	Medium	High
Employee 9	High	Medium	High
Employee 11	High	Medium	High
Employee 14	Low	Low	High

Table 18 : Summary of Employees perspectives on attitude towards green Information Systems initiatives in logistics operations

Triple Bottom Line: Employees' perception

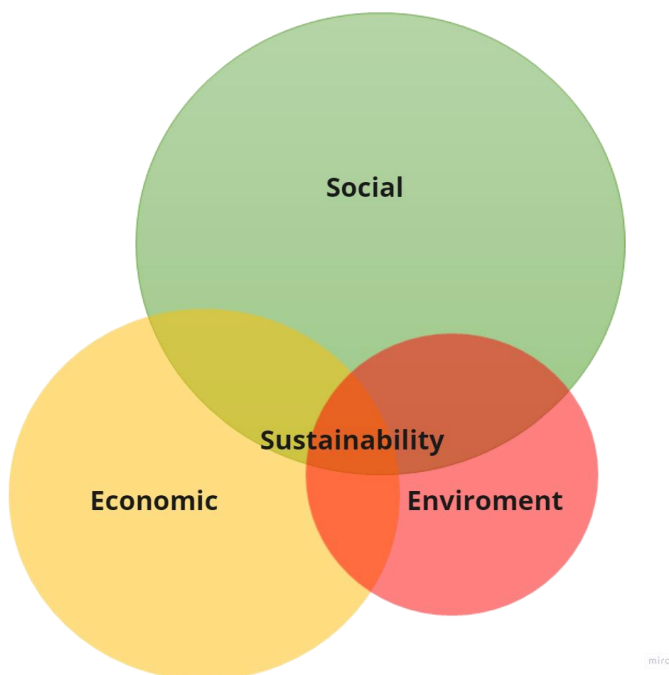


Figure 13: Employees' Perception applied to the Triple Bottom Line.

4.4 Gaps in Green Information Systems Adoption and Opportunities for Improvement

This section further investigates how Green Information Systems are being adopted in the post/logistics sector. Four questions were put to the participants to accomplish this goal, and the results are provided in the following subsections.

4.4.1 Gaps and Opportunities

For the logistics sector to become more sustainable, it is crucial to recognize the gaps in the implementation of Green Information Systems practices. The first question on this topic was formulated to investigate if the participant experienced some gaps in the adoption of Green Information System practices in the logistic industry. From the responses, the participants identified some interesting patterns and difficulties that businesses in the logistics sector are having in implementing more environmentally friendly practices.

Examining the leaders' perspectives first, the replies showed a focus on automation. The potential for cutting-edge technology, such as robot arms to sort parcels, was emphasised by Leader 7 to improve productivity and lower errors in the logistics process. In addition, Leader 2 mentioned the desire for automation regarding package scanning and label printing.

"I feel that technology can help speed up our processes within the department because there are people working here. There are people who put the packages on the belts and cages. For example, there could be a robotic arm that sorts the packages. It will be faster and lead to less errors. I think this is the future."

-Leader 7

"We do some manual work where we physically scan the parcels when they come to our department and print out the labels. I think it would be useful to develop an automation process where we could scan the parcels in a machine, store its information already in our intern system and update the tracking status, then print and attach the labels. That would be a great improvement in our department."

-Leader 2

Another key theme that emerged from the leaders' participants' responses was the desire for digitalization. For example, Leader 4 stated how replacing their paper lists with digital information would improve organisation and manageability and be more sustainable.

It is expected 2000 containers per day, and each of them has a list printed in paper A4 for sorting the transportation, these lists are quickly discharged after full loading and addressing the cages to their destination.

"... I have been asking for many years to create a system with a digital list that replaces lists on paper. This makes it more transparent as we deal with many swap containers that are constantly increasing due to the increase in volume through the years."

-Leader 4

The difficulty of implementation was another topic that arose from the leader's replies. Although some participants believed that the necessary systems were already in place, others pointed out that it takes time for new systems to be optimised and advocated for the necessity for ongoing improvement.

"I don't feel like there are any new systems that could have been introduced in my unit. But in terms of sorting techniques, we have implemented a system this autumn, but like other things, it takes time for the system to be optimised, especially when it comes to learning how to use it properly."

-Leader 3

On the other hand, when posed this question, the employees provided responses that were far more generic than those provided by the executives. It is important to note that most employees were not given the opportunity to provide feedback on this issue. Employee 6 said that this was a question for their leaders to address, and that they did not have any involvement on the subject.

"I don't see any gaps in my area or things that could be done better. As for me, I don't remember being asked about this by any of my managers. I think that the managers need to think about these things. Our job is just to do the work with the systems available."

-Employee 6

In contrast, four employees from two different departments identified problems with the adoption of Green Information Systems. Their responses were connected to the proposals made by their leaders about the automation and digitization of processes. Employee 7, for example, emphasised the opinions of the shipping manager about the digitization of the scanning lists and described how the job that is being done at this moment is both inefficient and harmful to the environment.

“I see a big difference in how things may be done in my area. I have no idea how many papers I print and throw away each day. We use the papers to label the different cages we have. There should be a way to do this that is better. Maybe switch them with an electronic board?”

-Employee 7

4.4.2 Enhancing Sustainability through Green IS

The topic of how Green Information Systems may be able to assist the post/logistics industry in transitioning to more environmentally friendly business practices is one that is garnering an increasing amount of attention. The participants were asked to respond to the question "How do you think Green Information Systems may help the post/logistics industry move toward more sustainable business practices?".

The goal of this investigation was to get a deeper understanding of their perspectives about the potential benefits of Green Information Systems, as well as the challenges and opportunities associated with these systems.

Responses provided by the leaders revealed several recurring themes about the ways in which Green Information Systems might help the logistics industry move towards more sustainable practices. These topics include the need for technological advancement, automation, integration, as well as the necessity for management help, emission reduction, reporting, and monitoring. In addition, there is a requirement for monitoring and reporting.

The lack of technological advancements in electric trucks and cars is a significant barrier for the industry's efforts to become more environmentally responsible. Leader 7 identified this as a key challenge, noting that the current state of battery technology limits the

driving range of electric vehicles, which makes them unsuitable for long-distance transportation and logistics.

"... So, we don't drive electric cars between the terminals. Much of this is because the technology has not been developed enough to introduce these cars and trucks. It's not always viable to charge the cars between trips, it's time consuming and we would need to change to longer routes to find these charging stations. Once this is developed, we will move towards more sustainable business practices."

-Leader 7

The examination of the responses of leaders also discovered some cases when technology did improve the efficiency of postal/logistical operations while simultaneously reducing their negative impact on the environment. This is a finding that may be viewed as more promising. The automation of package sorting using integrated scanners and information systems, for example, has resulted in a more sustainable business practice. This approach has led to considerable savings in the amount of energy used and the amount of trash produced.

"For example, if we take a new system that we introduced, we managed to save 50% of electricity costs – expenses went down along with CO2 emissions. Furthermore, these systems contribute to less deterioration and depreciation – which resulted in our cars having fewer stops and fewer trips."

-Leader 1

Participant 4 also mentioned the important role of Green Information Systems and electric vehicles – but delved more into how they take out reports from the existing systems.

"We have already implemented systems that contribute to environmental friendliness. For example, we have reports we can take out in relation to environmentally friendly driving and economical driving."

-Leader 4

Leader 3 explains more on how these methods maximise capacity while simultaneously reducing the number of empty runs and cutting down on the amount of time spent on the training of substitutes. Leader 2 highlights how Green Information Systems have automated and optimised the sorting efficiency using integrated scanners and automated machines throughout the course of Leader 2's thirty years of experience working for the firm.

It is noteworthy to mention that among the group employees, they were a common point that the electrification of the car fleet is a huge contribution to lowering emissions and helping the environment. When questioned about systems employed by their department, they did not have a coherent response ready to give. Only one employee provided input regarding how a green sorting system that managed the waste they produced while repackaging damaged packages could contribute to a greener practice.

“I am not sure if my idea of system could be implemented within our terminal areas due to the lack of space, but by sorting the damaged waste of packaging into renewable packaging. Just like the uniforms we were – which are based on renewable particles”.

- Employee 1

4.4.3 Barriers to Green Information Systems Implementation and Solutions

In this section, we are going to shift our focus to the challenges and obstacles that businesses may face when putting these concepts into action. Participants were requested to discuss their ideas in response to the following question: "What obstacles do you see in implementing Green Information System practices, and how could they be overcome?"

Their replies gave insight into the different challenges that might inhibit the implementation of Green Information System practices. These issues include resistance to change, technological restrictions, and budgetary limits. In addition, the participants suggested several methods for overcoming the obstacles that were shown to them.

The contributions of two of the leader participants can be categorised as examples of technological advancement. However, their perspectives were only marginally different from one another. The first leader brought up the current constraints of technology and noted the

tendency of organisations to delay the deployment of new technology until it is more robust and has been developed further.

Leader 2, on the other hand, acknowledged the need for new technology and emphasised how open the organisation is to new ideas so long as they can be validated as being economically practical. Leader 2 also emphasised how open the company is to new concepts. His response was as follows:

"I feel like the technology doesn't exist and that's why we haven't introduced this. Our company is very open to new ideas. As long as the technology and the proposal can be well justified and consistent with the investment made on it, I believe it will be introduced."

-Leader 2

Leader 8 brought up the economic factor by emphasising its importance. It is important to take note of how he went on to comment on how the organisation must find methods to integrate Green Information System practices within the budget that is already in place.

"I feel like the reason could be economical — and that's why maybe similar systems are being postponed."

-Leader 8

Another interesting pattern that was observed from the leaders, was that they saw the resistance of their employees to new technologies as an obstacle. Some of these leaders suggested that the employees should work on overcoming this resistance, while others pointed out that the older a person was, the more resistant to new technologies they tended to be, with very few exceptions.

"It's the mentality. I think there are no obstacles in the technology itself – our systems tend to be quite easy to use. The obstacles are more related to the people who are going to handle these systems."

-Leader 3

This claim is also discovered to be contained inside the employees' transcripts. When we asked them which restrictions they observe, they all responded in the same way, which

was that they primarily operated using scanning technologies that required little human input and did not perceive any obstacles with the systems they are currently using.

However, some of the employees commented that some new systems were difficult to use and that they did not receive sufficient training on how to operate the systems. One worker from the shipping department further elaborates on this fact, explaining how they attempted to install a new system into their area, which ultimately resulted in a significant loss for the business.

“So, the leaders tried putting in place several different systems. But we found that this one did not go as planned. The teaching wasn't good enough for people to learn how to use it and see its benefits. We were basically told to learn by doing, which caused a lot of trouble and was a major setback for the project.”

- Employee 5

Lastly, Participant 1 from the leader group provided an interesting angle. In addition to economical factors, external factors beyond their control seems to be an obstacle implementing the Green Information Systems, and quoted:

“I would say that it is not the systems themselves that are obstacles, but external factors over which we in our company do have control and, in some cases, internal factors within finance.”

-Leader 1

In this section, we went through three of the obstacles presented as summarised in table 19.

Obstacles	Participant
Lack of existing technology/systems	Leader 2, Leader 7, Employee 2
Financial constraints	Leader 4, Leader 8, Employee 1
Resistance to change	Leader 3, Employee 3, Employee 5, Employee 11, Employee 12, Employee 14
External factors beyond control	Leader 1, Employee 4, Employee 9
Time-consuming development process	Leader 6

Table 19: Obstacles to Implementing Green Information System Practices.

4.6 Summary of findings

As shown in both interviewees and literature review, the concept of what Green Information Systems is not broadly diffused, which interferes in a conscient adoption of these systems. However, after a brief explanation, all the participants interviewed could point out at least one Information System in their department and describe them with details that could answer our questions. From a general perspective, the interviewees have a positive attitude towards the incorporation of Green Information Systems. Most of them were aware of the ways in which these systems will improve performance, especially the leaders.

We also investigated the choices made by this post/logistics company regarding the relative importance of economic, environmental, and social considerations. It was emphasised how important it is to have a good understanding of how successful post/logistics companies find a balance between economic, environmental, and social issues when adopting sustainable practices that help both society and the environment while also being profitable for the business.

Participants' responses varied; while employees placed a higher priority on social issues than on economic issues, leaders viewed economic benefits as their primary goal, with the environment acting more as a beneficiary of a positive externality caused by their goals of cutting costs and waste. This is also illustrated on figure 12 and 13.

In addition to this, the potential for Green Information Systems to aid the logistics industry by fostering the adoption of environmentally responsible business practices was investigated. Participants were strongly encouraged to share their thoughts regarding the role that Green Information Systems may play in assisting the industry in being friendlier to the environment. The analysis of their comments revealed many recurring themes, the most prominent of which was the importance of rapid technological improvement, as well as integration, automation, and administrative backing. Some of the hurdles that must be overcome to successfully implement Green Information System practices include technological limitations, budgetary limitations, resistance to change on the part of employees and their mentalities prone to avoid changes the older they get, and external variables that are beyond the control of the business.

Applying these findings to the Triple Bottom Line demonstrates that the company's current practices place the greatest emphasis on the economic aspect, then the environmental and social aspect. The economic practices are centred around implementing practices that increase productivity and efficiency while minimising costs. Figure 14 illustrates how we modified our findings to fit the Triple Bottom Line and the case company. This figure illustrates the company's current position (AS-IS) and is in alignment with the managers perceptions as it is them who implement the practices in their department.

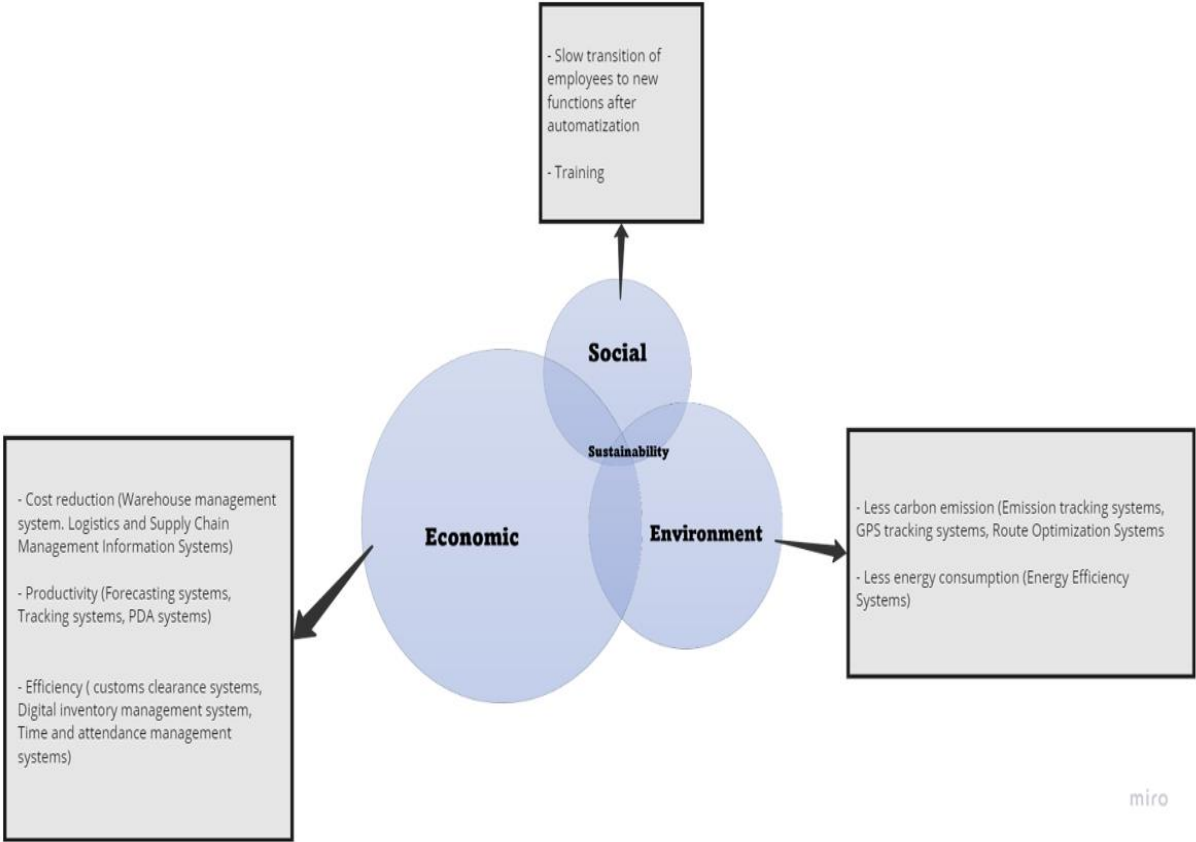


Figure 14: AS-IS illustration of the case company adapted to fit the Triple Bottom Line.

5. Discussion

This chapter aims to resolve our overarching research:

“What are the impacts of Green Information Systems on the post/logistics sector in Norway?”

Further on, it will be addressed through essential concepts from the Triple Bottom Line (TBL) framework in conjunction with our findings from the literature review and conducted interviews.

5.1 What are the impacts of Green Information Systems on the post/logistics sector in Norway?

How do Green Information System practices impact the post/logistic sector in Norway?

As shown in section 4.2, the managers in our case have been driven mostly by economic factors, while the employees have been focusing more on the social aspects. On one hand, managers need to follow budgets and operate in a business with small economic margins. It is not a surprise that they tend to be concerned about the value created through Green Information Systems. On the other hand, employees who are facing the advances of technology and sometimes seeing automatizations as threats to their jobs, tend to look at the social side of these trades off between manual and digital labour. Figure 15 illustrates how we position the company based on the findings in the Triple Bottom Line.

The main aspects presented in the findings was the high efficiency created from Green Information Systems. The capacity of the various machines used in the company outruns any manual worker and the speed of the work has never been so high. The implementation of smart systems is broad, it is present in control of the flow of the production, in the routing

process, in removing the need of specialisation of the workers in some areas, in the creation of reports and in the improvement in efficiency in the company in general, allowing to cut costs in all segments.

Interestingly, even though employees and managers had differing perspectives and valued various components of the Triple Bottom Line, those groups were not in accordance with how the Triple Bottom Line's designer desired it to be due to the large discrepancy between the elements. Elkington (1998) offers a balance of these three factors, which does not have to be necessarily perfect. Based on our findings, we argue that there is no harmony between the three aspects, showing that the economic aspect dominates, undermining the social and environmental aspects.

The literature on Triple Bottom Line mentions how new thinking and a transformational approach is required to look how a company could gain benefit in the long-term (Bocken et al., 2014).

Looking back at figure 8, we can see how our case company could potentially benefit from operating on the "sustainability sweet spot" and serve in harmony regarding the three aspects of the Triple Bottom Line. According to (Savitz and Weber, 2014), functioning in this sweet spot can lead to increased efficiency, corporate growth, and innovation. However, how could our case company operate on this optimal spot? In our literature review, two concepts were introduced: Circular Economy and Reversed Logistics.

These concepts have shown to increase sustainability (environment, social and profitability) by creating closed loops, which we argue could contribute to a much more balanced relationship between these main aspects.

Figure 15 illustrates how we placed the Circular Economy in the "sweet spot". However, we point out that to have a circular economy in the first place, the company needs to implement Green Information Systems in both Product Acquisitions, Collections and Inspection & Sorting - elements stated on figure 7. After these implementations, we could say that Green Information Systems are contributing to a more harmonic relationship between the three aspects of the Triple Bottom Line.

The next section will discuss each aspect of figure 15 in greater detail considering our findings, presented literature, and theoretical framework.

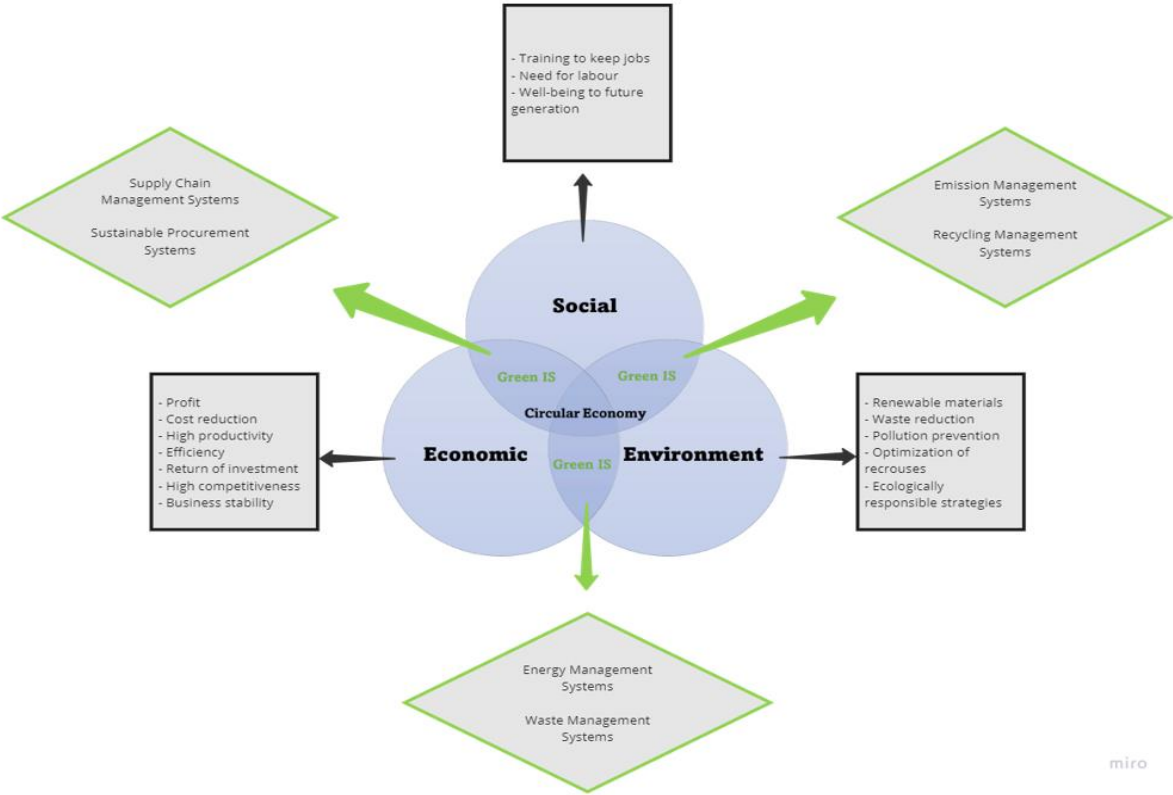


Figure 15: The Synergy of Circular Economy and Green Information Systems in Enhancing the Triple Bottom Line.

5.1.1 Economy

Economy is pointed as the main factor the case company weight when making decisions. The main finding from our interviews was that Green Information Systems are creating high efficiency and productivity through digitalization and automatizations.

The pursuit for sustainability is more seen as a burden due to the trade-offs on the economic aspect it requires. These trade-offs have been elaborated on in the literature - and been one of the biggest critiques on why it is difficult for a company to operate fully sustainable by balancing the three aspects of Triple Bottom Line. Although Santiago-Brown et al. (2015, p.2) claim that equilibrium may be pursuit between economic, social, and environmental factors, is this possible? Could the concept of Circular Economy be the solution? In order to do so and understand why the environment and the social factors has been seen as trade-offs, the current practices motivated by the economy will be further investigated.

We identified how the company is improving their logistical performance by doing the same delivery with fewer trips (Route Optimization Systems). Another example is the sharing system for work log in real time that allows them to make less mistakes using the correct data and be more precise about their next actions (Forecasting Systems). These two instances demonstrate how Green Information Systems affect the business's production and efficiency.

Further on, they applied different automatization processes, substituting completely manual work for technological performed work. For instance, scans, automatic selection of packages, reports of performance from their systems and substitution to a new electrical fleet (Warehouse Management Systems). Looking at the current practices in the case company, they were mostly pointing towards a new transformative implementation, which is necessary for a transformational approach of the TBL, according to (Boons and Lüdeke-Freund, 2013).

Looking at how they perceive the cost of these Green Information Systems, they are very careful on which implementations to make. Although their history says that all those implementations made so far point towards financial gain, making them able to cut costs with production in general. For example in distribution, warehousing, planning and employment.

As we now have identified these practices - and investigated the reasons for their implementation. We understand that the case company's interest is in putting its own needs ahead of the needs of the environment. This is legitimate; the case company depends on profits to stay in business and is not a non-profit. Thus, we do not draw this assumption to be reflected upon the whole company, but only how we perceive their choices for implementations on the investigated warehouse.

However, how could Circular Economy help the case company to pursue equilibrium between the economic, social, and environmental aspect? This section will further focus on the economic aspect.

Literature on Circular Economy indicate that it is possible to maintain sustainability and increase profitability - which are in accordance with our case company interest. The change from a linear to a circular value chain would lead to an increased demand of logistic needs since the product end life would increase.

Based on the identified practices, we argue that the company could account for these increases as they are always thinking on how to be more efficient and productive. Their

biggest obstacle is within how product acquisition, collection, inspection & sorting is required to create them (illustrated on figure 7). These elements are crucial. From our findings, we could not see big traces of them in the company. In fact, both leaders and employees indicated that they did not have any systems or procedures on how they manage their waste disposal.

Prior literature has elaborated on the obstacles companies need to overcome and implement Circular Economy. Govindan and Hasanagic (2018) highlighted two technological difficulties: decision-makers lack timely or reliable information, and material separation.

Looking back at the findings, on the one hand, Green Performance reports were only available to Leader 4, Shipping department's Emission Control System and how little he used them. On the other hand, the case company had good systems on tracing, forecasting, measuring effectivity and productivity. Green reports must standardise measurement KPIs across the entire value chain, but they must do so while keeping in mind that there must be no negative impact on the economy (Gholami et al., 2013).

Second, the limited technology in our case company for material separation makes it challenging to separate the materials. The managers explained how the garbage generated was improperly sorted to be further used in their value chain. One leader showed that their uniforms were manufactured entirely from recyclable materials, showing some Circular Economy implementations, but better practices are needed within their department. In the end, a more efficient company produces less waste (Watson, Bordreau and Huber, 2008).

5.1.2 Environment

Moving over to the environmental aspect of the Triple Bottom Line, it was discovered that the managers evaluated the importance of the environmental lens second, after the economic aspect. Managers had a solid grasp of how supportive Green Information Systems could be for the environment. They are aware of how their business contributes to the problem and they want to offer solutions.

For instance, a manager from the technical department, spoke on how their new system has contributed to lowering the energy use by 50% - reducing the environmental footprint and reducing cost of operating.

However, still we argue that the implementation is motivated by economic factors rather than environmental reasons. The only direct implementation we could tie back to the

environment is the electrification of the car fleet, which could be argued due to pressure from externalities (i.e. government and stakeholder).

Moreover, employees seemed to value the environmental aspect the least. Their main concern was the social factor and how the implementations should not affect them negatively. This will be further discussed in the next sub section. On the other hand, we could reflect upon the reason for why the environmental aspect comes before the social for the managers. The pressure from externalities was signified by the leaders.

One of the managers underlined how the external stakeholders are constantly putting pressure on with green solutions. It seems that the population has a good awareness of the consequences of these companies to the environment, and the market does behave in favour of the companies that show them that they care about their values and are doing something to minimise their footprint in the environment.

Kumar (2015) goes into further detail on the marketing demand and environmental concerns that drive businesses to require green practices in their logistical services. It is interesting that he goes on to explain how businesses use these green measures to boost their public image rather than to benefit the environment, which appears to fit with our perception of the case company practice.

Moreover, as discussed in the economic aspect section, Circular Economy does not require the company to truly care about the environment - if the practices are helping the environment. We do not aim to change their perceptions but provide a discussion on how by implementing the concept could remove the trade-off by maintaining profitability and increasing sustainability.

Furthermore, according to empirical studies, a corporation is more likely to increase its competitiveness the faster it develops dynamic capability in response to change (Li and Liu, 2014). Based on the findings we could see how the company experienced pressure from externalities. We argue that by implementing Circular Economy and closed loops, the company could retain their core interest in the economy. But how could the Circular Economy, and our presented figure 15 contribute to the environment?

Our findings have shown a need for better waste management systems. This finding is also important within the implementation of Circular Economy as better waste management

would increase the end-life of the product. The leader of the technical department informed us on how they have implemented systems to quickly identify broken parts - and fix them. Furthermore, he elaborated on a solution he witnessed with 3D printing broken parts. This is indeed a possibility to implement closed loops by providing renewable materials and waste reduction. Linking this statement to the closed-loop supply chain on figure 7, it would fall under repair or remanufacture.

Looking at the broader picture, the company could implement such practices in all departments by acquiring good product acquisition, collection, and inspection & sorting systems. Not only would it benefit the environment positively by preventing disposal, but it would increase the profitability of the company by optimising efficiency systems.

Referring to the study conducted by (Gholami et al., 2013), there are some barriers which could be tied up with our findings. Firstly, there is some technological limitation by tracking recycled materials. Secondly, lack of a standard system for performance indicators regarding measuring Circular Economy. Furthermore, the measurement difficulties are also evident on the critiques of The Triple Bottom Line.

However, we see this as an opportunity, rather than an obstacle. Circular Economy and Green Information Systems are relatively new concepts within the logistic sector - and are in fact still in development. Our case company is perceived by the participant to be a market leader on innovation, technology and quality. By being able to develop these standardised measurement methods and aid the business in measuring itself in accordance with the Triple Bottom Line, this would help them with the adoption of the circular economy and Green Information Systems.

Before moving over to the social lens, it is important to mention that our measurement of the environmental performance illustrated on figure 14 are only based on our assumption and information the participants gave us. However, comparing their perceptions and adoption with the existing Green Information Systems and literature, our indication on the prioritisation due has some ground.

5.1.3 Social

Another important aspect of the Triple Bottom Line is how the utilisation of Green Information Systems in this company affects the employees, customers, and society in general. Based on the findings, we were informed of a department that before was thriving

with workers, now it is quite silent, with the noise coming predominantly from the machines. Much of the labour was laid off to give space to digitalization.

The concerns about the social aspects seem to be the most relevant among the employees as figure 13 illustrates. On the other hand, figure 14 shows the reality on how little the social aspect has been considered during new implementations.

There were still some comments from the employees signalling the fear of losing their job. We argue that this misconception of the employees is related to misunderstanding how Green Information Systems really work. This is questioned because several employees stated that their working lives were made considerably easier. An example was given of how, prior to the Green Information System in their department, they had to memorise all the information in their heads, resulting in their calling in ill on sometimes due to too much stress.

The comments of those who had been employed longer and were there during significant automation deployments, including the smart warehousing, revealed how the corporation had changed their jobs. In other words, automation did not eliminate jobs; rather, it created new positions that must be filled, much more interesting tasks to be performed than the routine-based work. The management further highlighted that their choices regarding the implementation of new technologies would not result in job losses, that they would offer internal training, and that they would gradually transition employees into new and more interesting roles.

Furthermore, one of the leaders mentioned a recent project they took to address societal issues. The manager went on to explain how they have a solid distribution network in Norway and recognized a chance to assist the elderly generation. The idea aims to provide the senior generation with information once a week from their drivers along the established routes. The project is supported by local governments all throughout the nation and is in line with the UN Sustainable Development Goals.

However, we understand that the case company is providing internal training after implementing a practice aimed to increase productivity and efficiency. The only practice that was purely socially implemented was the well-being solution to the elderly generation. This is

however not wrong, but how could the company increase their focus on the social aspect of the Triple Bottom Line with Circular Economy?

In the previous subsections, we have elaborated on how closed loops increase logistic needs. In other words, new jobs are required to fill the demand. Based on the findings, the company seems to have a good training practice and are indeed allocating internal employees into new roles. The only misconception might be related to the misunderstanding on how automation plays a role - and therefore could impact the resistance to change - what could be a dangerous factor for the case company due to the fact Circular Economy and the pursuit to equivalence with regards to the Triple Bottom Line require changes (Boons and Lüdeke-Freund, 2013). On the other hand, by overcoming this challenge, the employees and the company would further develop as new skills are required to operate - suggesting an increased focus on the social aspect.

We can also argue that the concept of waste management and reutilization of products is a way of taking care of the environment now, while securing a better future for the next generations.

Moreover, to the external factors Circular Economy, the concept could increase the reputation with its stakeholders. Our findings showed how the company is strongly trying to satisfy the customers and partners as they demand for greener solutions. By implementing Circular Economy, the company would not only increase their profits, but also satisfy the stakeholders needs. We elaborated earlier the need for better measurement technology. By developing this technology with Green Information Systems, the stakeholders would not only meet their demands - but also trace back their contribution to the Circular Economy and sustainability.

Implementation of Circular Economy would need the cooperation and involvement from the customers and partners. By increasing the awareness of benefits to all parts of the value chain - the transition to a circular economy will be easier for our case company. Furthermore, gathering companies in the sector and formulating guidelines as well as standardised goals may contribute to Triple Bottom Line being more applicable and valuable in practice.

5.2 Summary of Discussion

The Triple bottom line framework analysis showed that the economic aspects had a higher weight when compared to the other elements. For a company to be successful it is necessary to find the “sweet spot” between economy, environment, and social aspects. In this chapter, we discussed how the Circular Economy with help of Green Information Systems could be the new “sweet spot” generating a more balanced relationship between these Triple Bottom Line aspects. We argued that the company could still be profitable and sustainable without looking at the environmental and social aspects as trade-offs.

6. Contribution and suggested further research

This study contributes to the Green Information System literature by providing a case study empirically assessing how Green Information Systems have impacted practices on one of Norway's largest mechanical terminal. The literature review found a gap on how little research there is on Green Information Systems within the context of post/logistics and was mostly dominated by literature reviews.

We hope our research question and objectives have contributed to how Green Information Systems have impacted the post/logistic sector, and how Circular Economy could be an enabler for companies to seek equilibrium between the three aspects of the Triple Bottom Line. The next sections will further describe the twofold contribution.

6.1 Theoretical contribution

The Presthus and Munkvold (2016) instructions to junior researchers on how to frame contributions will be used in this section. The first five types of contribution are (1) Concept, (2) Construct, (3) Rich insight, (4) Case study or action/field research, and (5) Framework, Taxonomy. The full list can be seen in appendix 9.22. We applied the Elkington (1997) TBL framework for analysis of this case study. All three aspects within the framework proved to be relevant, by addressing these three aspects with regards to Green Information Systems within post/logistics.

However, the economic factor was no doubt the priority for the company. Our findings indicate and confirm much of the existing information on the chosen theoretical framework. Therefore, we argue our findings with reference to the guidelines Presthus and Munkvold provided, contribute to the existing theory, and confirm the validity of the framework within Green Information Systems, even after 36 years of its origin.

We have made an attempt to create a figure explaining our findings, however this is not justified to be called a framework. Looking back at the contribution table provided, our theoretical contribution might fit within the lower of the hierarchies.

On the other hand, when the participants were asked what could be done to make this segment more sustainable during the interviews, we brought up the idea of information

systems and encouraged the interviewees to search for possibilities for improvement. Johansson and Jonsson, 2013, wrote that an increase in the awareness of a subject influences the doing, the recognition of the environment and creates new habits. We argue that our contribution is a Case study since we provided a study with a rich description of Green Information Systems in its natural context.

6.2 Practical contribution

This dissertation contributes to the existing literature on the field of Green Information Systems and post/logistics. It addresses the gap on how the Green Information System impacts the logistic sector. Furthermore, we hope our insight on how Circular Economy together with Green Information Systems could help organisations pursue harmony between the three factors of Triple Bottom Line.

The main practical contribution from this study could be categorised under the real-world problem by providing post/logistics companies an approach on how to become more sustainable while being profitable. On figure 16 below, we have illustrated a possible roadmap to how the utopian classical concept of the Triple Bottom Line could come to reality.

The first step (1) presents how Triple Bottom Line requires companies to be. The second step (2) illustrates the current position of our case company regarding the Triple Bottom Line - far from ideal. The third step (3) shows how the concept of Circular Economy operates with closed loops creating higher demand for logistic services due to the longer end-life of a product, increasing social and environmental aspects keeping the economy at a high pace. The last step (4) illustrates a potential product of these implementations of Circular Economy and Green Information Systems, making utopia reality with time.

Given the detail above and the guidelines presented by Presthus & Munkvold, it seems to best be fitted within Guidelines/Roadmap of a practical contribution. This is argued due the fact it provides a solution on how post/logistic companies could be sustainable while generating profit. On the other hand, we understand this roadmap would possibly look different if more aspects and different scenarios were included. Furthermore, we are investigating two relatively new concepts within logistics. However, we hope this roadmap could open for further research by the Information Systems field.

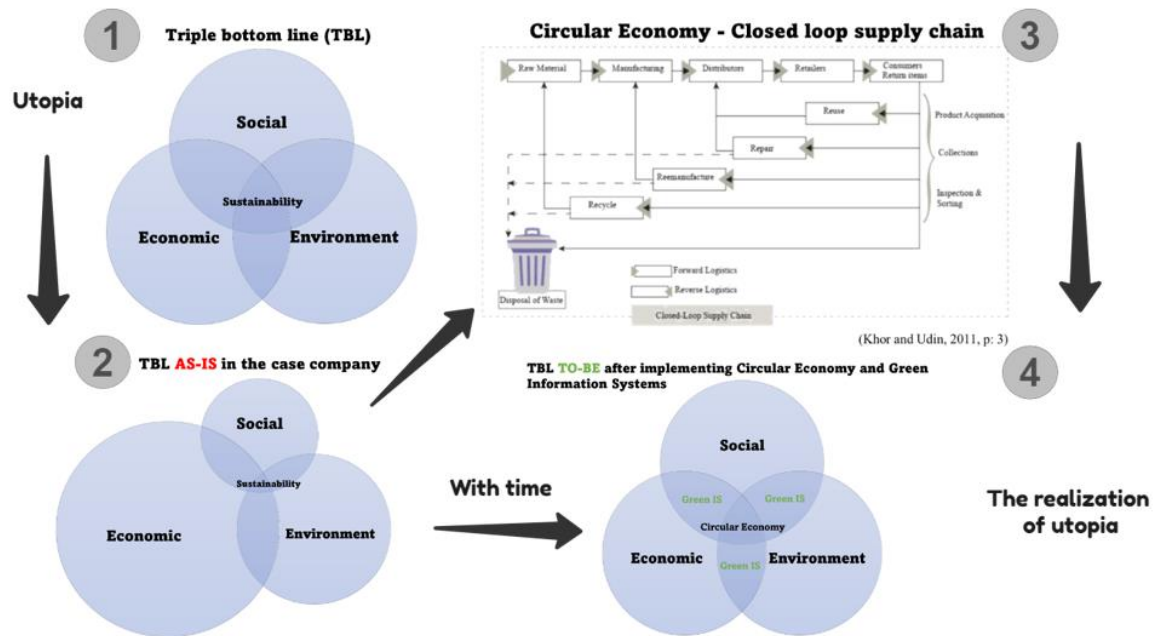


Figure 16: Our Attempt at Mapping a Roadmap to the Utopia of the Triple Bottom Line

6.3 Limitations and suggested further research

This dissertation has gathered answers from both managers and employees from one of the leading companies in the post/logistic sector, investigating the impacts and adoption of Green IS practices.

The findings were much like the literature review applied for Information Systems in general. The suggestion for future research falls in almost all aspects of the study, like innovation, environment, finance, and social aspects. A similar study could be performed including the other steps of the supply chain pipeline, not only final distribution to the customer and retail, as shown in figure 10.

From our research, we could see the importance of Green Information Systems assisting the high performance of this company, but very little awareness of what Information Technology and Information Systems is, which end up resulting in shifting all the credits of Information Systems to mainly IT.

We advise more research into the field of Green Information Systems, highlighting its potential for innovation and related long-term effects. The relationship between innovation

and sustainability or the impact of these technologies on society, particularly in respect to job automation, could be interesting research topics.

Additionally, the use of Green Information Systems for labour recruitment has ethical ramifications that call into question our confidence in the use of these systems' databases to inform management choices. There is an urgent need for quantitative data that may offer unmistakable insights into value generation through Green Information Systems to support these areas of investigation.

We also recommend that a key component of research be the quantification of emissions and contamination directly related to Green Information System operations. This might be enhanced by recommending route optimization for existing trucks based on machine learning that considers their battery capacity and nearby recharge facilities. By better comprehending and utilizing these traits, we may leverage the transformative power of information systems for a sustainable future.

7. Conclusion

This case study has investigated the following research question:

“What are the impacts of Green Information Systems on the post/logistics sector in Norway?”

After analysing the interviews, we could find that the concept of Information Systems itself is not broadly diffused and understood, even with further explanation. The interviewees

confused pure Information Systems with Green Information Systems. However, both managers and employees are relatively open to new technologies if they are carefully implemented according to budget, training and if their jobs are kept. The awareness of the concept of Green Information Systems made them think about solutions for the company and ideas for new systems.

The sector seems to have a relatively good understanding of economic, environmental, and social aspects, although the financial goals weigh more than the preoccupation with being sustainable and the stakeholders are the ones pressing more for ecological approaches. Circular economy has shown to be a suitable solution to a better-balanced relationship between these aspects towards making an utopia to come true.

Their need for new technologies and custom-made systems has been enabling them to be competitive and occupy leading positions in the market. However much more can be implemented, as better routing solutions, digitalization's instead of using paper extensively, and to circular economy as previously suggested.

The theoretical contribution concerns the TBL framework, with regards to Green Information Systems in the logistic sector. Our contribution was able to confirm existing information and the validity of the framework, however, we argue for the need for more case studies investigating Green Information Systems from different perspectives as the phenomenon is still relatively new and has limited implementations in the logistic sector. On the other hand, our practical contribution makes an effort to offer a roadmap for how logistic organizations might pursue balance between the three components of the Triple Bottom Line with the support of the Circular Economy and Green Information Systems.

8. Bibliografy

Adams, R., Bessant, J., Jeanrenaud, S., & Overy, P. (2012). *Innovating for Sustainability: A Systematic Review of the Body of Knowledge*. NBS.

Alexander, J. C. (1987). *The Micro-macro Link*. University of California Press.

- Anthony Jr, B. (2019). Green information system integration for environmental performance in organizations: An extension of belief–action–outcome framework and natural resource-based view theory. *Benchmarking: An International Journal*, 26(3), 1033–1062. <https://doi.org/10.1108/BIJ-05-2018-0142>
- Azzi, A., Battini, D., Persona, A., & Sgarbossa, F. (2012). Packaging Design: General Framework and Research Agenda. *Packaging Technology and Science*, 25(8), 435–456. <https://doi.org/10.1002/pts.993>
- Bocken, N.M.P. *et al.* (2014) “A literature and practice review to develop sustainable business model archetypes,” *Journal of cleaner production*, 65, pp. 42–56.
- Boons, F. and Lüdeke-Freund, F. (2013) “Business models for sustainable innovation: state-of-the-art and steps towards a research agenda,” *Journal of cleaner production*, 45, pp. 9–19.
- Boudreau, M.-C., Gefen, D., & Straub, D. W. (2001). Validation in Information Systems Research: A State-of-the-Art Assessment. *MIS Quarterly*, 25(1), 1–16. <https://doi.org/10.2307/3250956>
- Brooks, S., Wang, X., & Sarker, S. (2010). Unpacking Green IT: A Review of the Existing Literature. 1, 398.
- Coelho, P. M., Corona, B., ten Klooster, R., & Worrell, E. (2020). Sustainability of reusable packaging—Current situation and trends. *Resources, Conservation & Recycling*: X, 6, 100037. <https://doi.org/10.1016/j.rerx.2020.100037>
- Conner, M., & Armitage, C. J. (1998). Extending the Theory of Planned Behavior: A Review and Avenues for Further Research. *Journal of Applied Social Psychology*, 28(15), 1429–1464. <https://doi.org/10.1111/j.1559-1816.1998.tb01685.x>
- Dao, V., Langella, I., & Carbo, J. (2011). From green to sustainability: Information Technology and an integrated sustainability framework. *The Journal of Strategic Information Systems*, 20(1), 63–79. <https://doi.org/10.1016/j.jsis.2011.01.002>
- Davis, F. D. (1985). A TECHNOLOGY ACCEPTANCE MODEL FOR EMPIRICALLY TESTING NEW END-USER INFORMATION SYSTEMS: THEORY AND RESULTS. Massachusetts Institute of Technology, 291.
- de la Torre, R., Corlu, C. G., Faulin, J., Onggo, B. S., & Juan, A. A. (2021). Simulation, Optimization, and Machine Learning in Sustainable Transportation Systems: Models and Applications. *Sustainability*, 13(3), Art. 3. <https://doi.org/10.3390/su13031551>
- Denzin, N.K. and Lincoln, Y.S. (2005) *The Sage handbook of qualitative research*. 3rd edn. Thousand Oaks, Calif: Sage.
- El Idrissi, S. C., Corbett, J., & Université Laval. (2016). Green IS Research: A Modernity Perspective. *Communications of the Association for Information Systems*, 38, 596–623. <https://doi.org/10.17705/1CAIS.03830>
- Elkington J., 1997, *Cannibals with Forks: The Triple Bottom Lines of 21st Century Business*, Capstone Publishing, Oxford.

- Fiksel, J. (2006) - The article presents a framework for sustainable materials management. It discusses strategies for optimizing the use of materials throughout their life cycle, including recycling, waste reduction, and efficient resource utilization.
- Gholami, R., Sulaiman, A. B., Ramayah, T., & Molla, A. (2013) - This article focuses on senior managers' perceptions of adopting Green IS and its impact on environmental performance. It presents the results of a field survey and explores the relationship between Green IS adoption and environmental outcomes.
- Govindan, K. and Hasanagic, M. (2018) "A systematic review on drivers, barriers, and practices towards circular economy: a supply chain perspective," *International journal of production research*, 56(1-2), pp. 278–311.
- Hart, J., Adams, K., Giesekam, J., Tingley, D. D., & Pomponi, F. (2019) - The article discusses barriers and drivers in implementing a circular economy in the built environment. It examines challenges and potential solutions for achieving circularity in construction and building practices.
- Henkel, C., & Kranz, J. (2018) - This article reviews the relationship between pro-environmental behavior and Green IS. It synthesizes existing research and provides directions for future studies in this area.
- Hu, Y.-C., Chiu, Y.-J., Hsu, C.-S., & Chang, Y.-Y. (2015) - The article identifies key factors for introducing GPS-based fleet management systems in the logistics industry. It explores the benefits and challenges associated with implementing such systems.
- Johansson, E. and Jonsson, H. (2013) "Thinking and Acting in a New Way: Influences of a Falls-Prevention Program on Participants' Everyday Life." *Physical & Occupational Therapy in Geriatrics*, 31(4), pp. 281–296.
- Khor, K.-S., & Udin, Z. (2011). "Impact of Reverse Logistics Product Disposition towards Business Performance in Malaysian E&E Companies." *I Journal of Supply Chain and Customer Relationship Management* (Bd. 2012). <https://doi.org/10.5171/2012.699469>
- Krumwiede, D.W. and Sheu, C. (2002) "A model for reverse logistics entry by third-party providers," *Omega (Oxford)*, 30(5), pp. 325–333.
- Kumar, A. (2015). "Green Logistics for Sustainable Development: An Analytical Review." 1(1).
- Laurell, H. *et al.* (2019) "Re-testing and validating a triple bottom line dominant logic for business sustainability," *Management of environmental quality*, 30(3), pp. 518–537.
- Lee, C. K. M., & Chan, T. M. (2009). "Development of RFID-based Reverse Logistics System." *Expert*
- Lee, C. K. M., & Lam, J. S. L. (2012). "Managing Reverse Logistics to Enhance Sustainability of Industrial Marketing." *Industrial Marketing Management*, 41(4), 589–598. <https://doi.org/10.1016/j.indmarman.2012.04.006>
- Lee, S.-Y.; Klassen, R.; Furlan, A.; Vinelli, A. The green bullwhip effect: Transferring environmental requirements along a supply chain. *Int. J. Prod. Econ.* **2014**, 156, 39–51

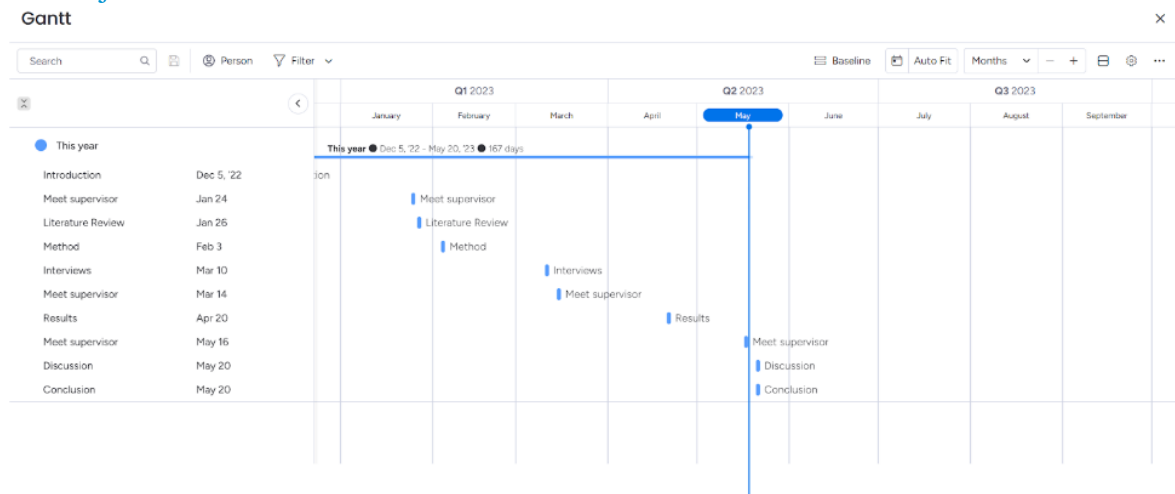
- Li, D.-yuan and Liu, J. (2014) "Dynamic capabilities, environmental dynamism, and competitive advantage: Evidence from China," *Journal of business research*, 67(1), pp. 2793–2799.
- Lin, C., Choy, K. L., Ho, G. T. S., Chung, S. H., & Lam, H. Y. (2014). "Survey of Green Vehicle Routing Problem: Past and Future Trends." *Expert Systems with Applications*, 41(4, Part 1), 1118–1138. <https://doi.org/10.1016/j.eswa.2013.07.107>
- Liu, J., Choy, K. L., & Lau, H. (2008). "Performance Improvement of Third-Party Logistics Providers? An Integrated Approach with a Logistics Information System." *International Journal of Technology Management*.
<https://www.inderscienceonline.com/doi/abs/10.1504/IJTM.2008.018105>
- Loock, C.-M., Staake, T., & Thiesse, F. (2013). "Motivating Energy-Efficient Behavior with Green IS: An Investigation of Goal Setting and the Role of Defaults." *MIS Quarterly*, 37(4), 1313-A5.
- Melville, N. P. (2010). "Information Systems Innovation for Environmental Sustainability." *MIS Quarterly*, 34(1), 1–21. <https://doi.org/10.2307/20721412>
- Mesjasz-Lech, A. (2016) "Urban Air Pollution Challenge for Green Logistics," *Transportation Research Procedia*, 16, pp. 355–365.
- Miles, M.B. and Huberman, A.M. (1994). *Qualitative Data Analysis: An Expanded Sourcebook*. 2nd edn. Thousand Oaks, Calif: Sage.
- Moore, G. C., & Benbasat, I. (1991). "Development of an Instrument to Measure the Perceptions of Adopting an Information Technology Innovation." *Information Systems Research*, 2(3), 192–222. <https://doi.org/10.1287/isre.2.3.192>
- Mustonen-Ollila, E., & Lyytinen, K. (2003). "Why Organizations Adopt Information System Process Innovations: A Longitudinal Study Using Diffusion of Innovation Theory." *Information Systems Journal*, 13(3), 275–297. <https://doi.org/10.1046/j.1365-2575.2003.00141.x>
- Myers, M.D. (1997) "Qualitative Research in Information Systems," *MIS quarterly*, 21(2), pp. 241–242.
- Norman, W. and MacDonald, C. (2004). "Getting to the Bottom of 'Triple Bottom Line'." *Business Ethics Quarterly*, 14(2), pp. 243–262.
- Oates, B. J., 2006. *Researching Information Systems and Computing*. 1st ed. London: SAGE Publications
- Patton, M. Q. (2002). Qualitative interviewing. *Qualitative Research And Evaluation Methods*, 3, 344–347
- Pickard, A.J. (2017) *Research Methods in Information*. 2nd edn. London: Facet Publishing.
- Porter, M.E. and Kramer, M.R. (2006) "Strategy & society: The link between competitive advantage and corporate social responsibility," *Harvard Business Review*, 84(12), pp. 78–92.
- Prescott, M.B. and Conger, S.A. (1995) "Information technology Innovations: A classification by IT Locus of impact and research approach," *ACM SIGMIS Database: the DATABASE for Advances in Information Systems*, 26(2-3), pp. 20–41.

- Presthus, W., & Munkvold, B. E. (2016). How to frame your contribution to knowledge? A guide for junior researchers in information systems. In Proceedings of the 37th International Conference on Information Systems (ICIS), Dublin, Ireland.
- Ramos, T. R. P., Gomes, M. I., & Barbosa-Póvoa, A. P. (2014). "Planning a Sustainable Reverse Logistics System: Balancing Costs with Environmental and Social Concerns." *Omega*, 48, 60–74. <https://doi.org/10.1016/j.omega.2013.11.006>
- Recker, J. (2016). "Toward a Design Theory for Green Information Systems." 2016 49th Hawaii International Conference on System Sciences (HICSS), 4474–4483. <https://doi.org/10.1109/HICSS.2016.556>
- Ren, R., Hu, W., Dong, J., Sun, B., Chen, Y., & Chen, Z. (2020). "A Systematic Literature Review of Green and Sustainable Logistics: Bibliometric Analysis, Research Trend and Knowledge Taxonomy." *International Journal of Environmental Research and Public Health*, 17(1), 261-. <https://doi.org/10.3390/ijerph17010261>
- Rodrigue, J.-P., Slack, B. and Comtois, C. (2017), "Green Logistics", Brewer, A.M., Button, K.J. and Hensher, D.A. (Ed.) *Handbook of Logistics and Supply-Chain Management* (, Vol. 2), Emerald Group Publishing Limited, Bingley, pp. 339-350. <https://doi.org/10.1108/9780080435930-021>
- Rogers, E. M., Singhal, A., & Quinlan, M. M. (2008). "Diffusion of Innovations." In *An Integrated Approach to Communication Theory and Research* (2nd ed.). Routledge.
- Santiago-Brown, I. *et al.* (2015) "Sustainability Assessment in Wine-Grape Growing in the New World: Economic, Environmental, and Social Indicators for Agricultural Businesses," *Sustainability (Basel, Switzerland)*, 7(7), p. 8178.
- Savitz, A.W. and Weber, K. (2013) *The Triple Bottom Line: How Today's Best-Run Companies Are Achieving Economic, Social and Environmental Success - and How You Can Too, Revised and Updated*. Rev. and updated, 2nd. San Francisco, Calif: Jossey-Bass.
- Sbihi, A. and Eglese, R.W. (2010) "Combinatorial optimization and Green Logistics," *Annals of operations research*, 175(1), pp. 159–175.
- Seidel, S., Bharati, P., Fridgen, G., Watson, R., Albizri, A., Boudreau, M.-C., Butler, T., Kruse, L., Guzman, I., Karsten, H., Lee, H., Melville, N., Rush, D., Toland, J., & Watts, S. (2017). "The Sustainability Imperative in Information Systems Research." *Communications of the Association for Information Systems*, 40(1). <https://doi.org/10.17705/1CAIS.04003>
- Seroka-Stolka, Oksana, & Ociepa-Kubicka, A. (2019). "Green Logistics and Circular Economy." *Transportation Research Procedia*, 39, 471–479. <https://doi.org/10.1016/j.trpro.2019.06.049>
- Silva, A., Rosano, M., Stocker, L., & Gorissen, L. (2017). "From Waste to Sustainable Materials Management: Three Case Studies of the Transition Journey." *Waste Management*, 61, 547
- Stake, E. R. (1995). *The art of Case Study Research*. University of Illinois at Urbana-Champaign, USA

- Svensson, G. *et al.* (2016) "A Triple Bottom Line Dominant Logic for Business Sustainability: Framework and Empirical Findings," *Journal of business-to-business marketing*, 23(2), pp. 153–188.
- Svensson, G. *et al.* (2016) "A Triple Bottom Line Dominant Logic for Business Sustainability: Framework and Empirical Findings," *Journal of business-to-business marketing*, 23(2), pp. 153–188.
- Systems with Applications, 36(5), 9299–9307. <https://doi.org/10.1016/j.eswa.2008.12.002>
- Takahashi, A.R.W. and Araujo, L. (2020) "Case study research: opening up research opportunities," *RAUSP Management Journal*, 55(1), pp. 100–111.
- Tharkur, K. (2021). *Research Design. Research Methodology in Social Sciences (A Short Manual)* (pp.175).
- Verdinelli, S., & Scagnoli, N.I. (2013). "Data Display in Qualitative Research." *International Journal of Qualitative Methods*, 12(1), 359–381.
- W. Li, M. Zheng, Y. Zhang, G. Cui (2020). Green governance structure, ownership characteristics, and corporate financing constraints. *J. Clean. Prod.*, 260 (2020), Article 121008
- Watson, T. R., Bordreau, M., Chen, A., & Huber, M. (2008). "Green IS: Building Sustainable Business Practices." *Information Systems*.
- Wei, C., Sun, X., Chen, Y., Zang, L., & Bai, S. (2021). "Comparison of Architecture and Adaptive Energy Management Strategy for Plug-in Hybrid Electric Logistics Vehicle." *Energy*, 230, 120858. <https://doi.org/10.1016/j.energy.2021.120858>
- Yang, Z., Sun, J., Zhang, Y., Wang, Y., & Cao, L. (2017). "Employees' Collaborative Use of Green Information Systems for Corporate Sustainability: Motivation, Effort, and Performance." *Information Technology for Development*, 23(3), 486–506. <https://doi.org/10.1080/02681102.2017.1335281>
- Yin, R. K., 2014. *Case Study Research: Design and Methods*. 5th ed. Thousand Oaks: Sage Publications
- Zhang, A., Li, S., Tan, L., Sun, Y., & Yao, F. (2022). "Intelligent Measurement and Monitoring of Carbon Emissions for 5G Shared Smart Logistics." *Journal of Sensors*, 2022, e8223590. <https://doi.org/10.1155/2022/8223590>

9. List of Appendixes

9.1 Project Plan



9.2 Information Sheet and Consent Form

Information sheet and consent form:

This document is presented to all my interviewees. It describes the main aspects of this study, as: our background, what the study is about and what I will ask you as a participant. Finally, there is a short consent for which we kindly ask you to complete.

Background

Our names are Abdullah Hassan Al Eboudi and Juliana Araujo Grøttjord. We are master's students at Kristiania University College. During the second year I am to write a dissertation of a chosen subject.

What this study is about

Our dissertation is about the Impacts of Sustainable Information Systems (Green IS) in the post/logistic sector. The expected outcome is identifying contributions and gaps prevention of Green Information Systems to the sector.

What we will ask of you as participant

Our research method is semi-structured interview, and I am asking you to please answer these questions from your point of view. Estimated timeframe is 40 minutes, but it is up to you if you want to finish sooner or take more time. The interview is completely anonymous, and it will not be recorded by any form. We will transcribe it afterwards and send it to your e-mail so you can add, remove anything you said or withdraw completely your answers. You will participate at your own discretion; it is entirely voluntary, and you may withdraw at any time. This will not have any consequences for any of the parties.

Thank you very much in advance for your time.

Contact information

My supervisor's name and e-mail: Wanda Presthus, prewan@westerdals.no

We can be contacted at this e-mail or phone number:

Abdullah: abal010@student.kristiania.no **Phone:** 91912272

Juliana: jugr008@ student.kristiania.no **Phone:** 94974640

Consent Form (the participant fills out)

I want to participate in this study

I am aware of that I can withdraw at any time during the study

Signature:

9.3 Guiding Questions for distinguishing interpretive research

Guiding questions for distinguishing interpretive research:

Guiding questions	Answer (Yes/No)
Data collection	
1. Does your interview sample target all available stakeholder groups?	
2. Do you use multiple methods for data triangulation?	
3. Do you aim to avoid researcher bias in the data collection?	
4. If your research includes multiple cases, do you apply a replication strategy for your selection of cases?	
Data analysis	
5. Do you use researcher triangulation in your coding and analysis?	
6. For cross-case analysis, do you focus on both similar and contrasting findings between the cases?	
Validation	
7. Do you apply 'traditional' criteria (reliability, validity) for judging the quality of your research?	
8. Do you take into consideration feedback from the informants that questions your interpretation of the findings?	
Reporting your findings	
9. Do you discuss multiple possible interpretations of your findings?	
10. Do you present your conclusions as predictive for similar settings?	

Figure 17: Guiding questions for distinguishing interpretive research. Land of confusion (Munkvold and Bygstad, 2016)

9.4 Interview Guide

Interview guide		
Introduce us and the theme, and give an overview of the interview. Explain the consent form, and get a signature before the interview starts.		
Parts	Theme	Questions
Part 1	<i>Role & Background</i>	1. Can you tell us a little bit about yourself? 2. Could you briefly describe your experience working in the logistics sector?
Part 2	<i>Green IS and Sustainable Economic Growth</i>	3. How familiar are you with Green Information Systems? 4. Could you give an example of a Green IS practice that has significantly impacted your organization's economic development and sustainability?
Part 3	<i>Manager/Employees Perception and Adoption of Green IS Practices</i>	5. What is your overall attitude towards the implementation of green IS initiatives in logistics operations? 6. How does your organization balance the trade-offs between economic, environmental, and social concerns when making decisions?
Part 4	<i>Gaps in Green IS Adoption and Opportunities for Improvement</i>	7. In your experience, what gaps exist in the adoption of Green IS practices in the logistics industry? 8. How do you think Green IS may help the logistics industry move toward more sustainable business practices? 9. What obstacles do you see in implementing Green IS practices, and how could they be overcome? 10. How do you envision the role of logistics companies in achieving the UN Sustainable Development Goals related to the triple bottom line?
Part 5	<i>Additional questions</i>	11. Do you have any other remarks or questions?
Debriefing		Explain rights, remember to get the consent form signed. Leave a copy with the participant.

9.5 Transcript Leader 1

08/03-23 - Face to face interview

P1 - 1 - Can you tell us a little bit about yourself and briefly describe your experience working in the logistics sector?

- I am 36 years old, married with two children. One aged *** and one aged ***. Worked for 16 years at ***, was manager for 10-11 of them. Worked primarily as a postman - but came over to the logistics department in 2018 where I worked with parcels and goods. Then got a new position in 2020 as *** manager - who also has the title of *** manager. This is one of Norway's largest parcel terminals. I am responsible for 15 managers.

P2 - 2 - How familiar are you with Green Information Systems?

- I would say that I am very familiar with Green Information Systems and the systems we use in general, that could be all of our management systems tools such as SAS and other internal systems that the company has itself designed after a long internal discussion, we ordered a system from China, but the drivers did not know how to use it, so we had to change them to iPads where they bring in the truck and have access in real time to the shipments log.

P2 - 3 - Could you give an example of a Green IS practice that has significantly impacted your organization's economic development and sustainability?

- I would say the most resourceful systems we use are the ones that give us forecasts. These systems allow us to be able to plan accordingly, so that we use the right resources against the right volume. For example, we are able to map the use of the right number of employees, so we can adequate it to the correct amount of work, and also the right number of cars used to deliver and optimise the trips.

P3 - 4 - What is your overall attitude towards the implementation of green IS initiatives in logistics operations?

- Have a positive attitude towards this as soon as the quality of the data is good. By quality, I mean whether the data is accurate. The design of the system and how it's user-friendly is just a plus.

P3 - 5 - How does your organization balance the trade-offs between economic, environmental, and social concerns when making decisions?

- If we take a further example where there is a technology that, for example, removes the need for five employees. First and foremost, technology won't cause the five employees to lose their jobs at once. Our company will highlight social concerns and allocate them to new jobs instead of recruiting new people to the other sectors that will increase with the higher productivity after the automatization.

P4 - 7 - In your experience, what gaps exist in the adoption of Green IS practices in the logistics industry?

- I feel we have all the systems we need. There is no "gap" in the introduction of green information systems which means that we have not implemented more.

P4 - 8 - How do you think Green IS may help the logistics industry move toward more sustainable business practices?

- For example, if we take a new system that we introduced, we manage to save 50% of electricity costs – expenses went down along with CO2 emissions. Furthermore, these systems contribute to less deterioration and depreciation – which resulted in our cars having fewer stops and fewer trip,

P4 - 9 - What obstacles do you see in implementing Green IS practices, and how could they be overcome?

- I would say that it is not the systems themselves that are obstacles, but external factors over which we in our company do have control and, in some cases, internal factors within finance.

P4 - 10 - How do you envision the role of logistics companies in achieving the UN Sustainable Development Goals related to the triple bottom line?

- *** has selected certain UN sustainability targets and introduced them internally in the company in order to achieve the targets. You can, for example, find the post's sustainability goals report which is publicly available. Here you will find different ways *** works to achieve these goals, as we, as a leading player in the market, have an important role - and not least to be a role model.

P5 - 11 - Do you have any other remarks or questions?

- No.

9.6 Transcript Leader 2

08/03-23 - Face to face interview

P1 - 1 - Can you tell us a little bit about yourself and could you briefly describe your experience working in the logistics sector?

- I have worked for *** for over 30 years and have been a manager for over 24 years. Currently working in a department called the hospital area with 42 people under me. This is a deviation department where all deviation packages arrive. Furthermore, I am also a machine supervisor and am responsible for everyone who runs machines.

P2 - 2 - How familiar are you with Green Information Systems?

- I am familiar with some information systems. For example, we use a system called LMK. This system gives us information about the package when we scan it.

P2 - 3 - Could you give an example of a Green IS practice that has significantly impacted your organization's economic development and sustainability?

- Yes, we changed a system which made a big difference. Previously we used a program called CONCEILER for LMK. Our VIP customers used CONCEILER

which led to large costs for the mail. *** implemented and developed a separate system called LMK.

P3 - 4 - What is your overall attitude towards the implementation of green IS initiatives in logistics operations?

- I have a positive attitude towards information systems as we primarily help develop our own systems. This leads to easier acceptance and use for us.

P3 - 5 - How does your organization balance the trade-offs between economic, environmental, and social concerns when making decisions?

- One thinks of the economy where a man works. If we take the example of the LMK program we implemented, I would say that the company made a choice based on economy and simplification.

P4 - 6 - In your experience, what gaps exist in the adoption of Green IS practices in the logistics industry?

- We carry out some manual work where we physically scan the packages when they arrive at our department. I could imagine that when a package arrives at my department, this process will be automated through, for example, a machine that scans and prints out the label in advance.

P4 - 7 - How do you think Green IS may help the logistics industry move toward more sustainable business practices?

- 30 years ago, we manually entered all postcodes into the system when sorting the package. Now everything is automated as our new machines have integrated scanners and read the information. I feel that this development and information systems in general can contribute to a more sustainable business practice.

P4 - 8 - What obstacles do you see in implementing Green IS practices, and how could they be overcome?

- I feel like the technology doesn't exist and that's why we haven't introduced this. Our company is very open to new ideas. As long as the technology

and the proposal can be well justified and consistent with the investment made on it, I believe it will be introduced

P4 - 9 - How do you envision the role of logistics companies in achieving the UN Sustainable Development Goals related to the triple bottom line?

- I thought that *** should act as a role model - and other companies look up to us. We talk about this further at our management meetings and shift meetings.

P5 - 10 - Do you have any other remarks or questions?

- No

9.7 Transcript Leader 3

08/03-23 - Face to face interview

P1 - 1 - Can you tell us a little bit about yourself and could you briefly describe your experience working in the logistics sector?

?

- I am 63 years old and have worked in the logistics industry since 1980 in very different roles. Both as a freight forwarder, IT manager, and much more. Right now I'm on the sidelines as I'm due to retire, but the department I managed is called production manager in operations close support. Here we process damaged consignments, unattended consignments, weigh and measure consignments that are too heavy to go to the facility, correct weight and measurements, search for groups, waste management and purchase of supplies.

P2 - 3 - How familiar are you with Green Information Systems?

- I am not very familiar with the "green" information systems - but have insight into some systems that were with the change from machine to automation. Furthermore, when I worked with IT in a company that was acquired by ***, we used systems. Here we used two production systems and various mail and BackOffice.

P2 - 4 - Could you give an example of a Green IS practice that has significantly impacted your organization's economic development and sustainability?

- Yes, anything that means you don't have to register things several times has given us economic development and sustainability. These systems have contributed to this. Everything from invoice systems, customs clearance points that have made our work more efficient. Furthermore, we also have sorting systems that tell the worker where the cage should be and how much the package weighs so that he can stack it correctly

P3 - 5 - What is your overall attitude towards the implementation of green IS initiatives in logistics operations?

- My position on this is that it makes sense to implement these systems. It is not a threat to those who work here, rather it contributes to more efficient and interesting tasks being carried out.

P3 - 6 - How does your organization balance the trade-offs between economic, environmental, and social concerns when making decisions?

- I feel that the company is very honest and fact-oriented when making decisions.

P4 - 7 - In your experience, what gaps exist in the adoption of Green IS practices in the logistics industry?

- In the unit I come from now, I don't feel that there are any new systems that could have been introduced. But in relation to sorting technology, we have implemented a system this autumn, but like other things it takes time before the system is optimized.

P4 - 8 - How do you think Green IS may help the logistics industry move toward more sustainable business practices?

- These systems help us to spend less time on training and more use of substitutes as the information is in the systems. There must also be capacity

optimization when it comes to filling up the units and driving as little empty as possible.

P4 - 9 - What obstacles do you see in implementing Green IS practices, and how could they be overcome?

- It's the mentality. I think that there are no obstacles in the technology - but more the skepticism of people who will handle these systems.

P4 - 10 - How do you envision the role of logistics companies in achieving the UN Sustainable Development Goals related to the triple bottom line?

- *** and *** can contribute with efficient routes and use non-polluting means of transport.

P5 - 11 - Do you have any other remarks or questions?

- No

9.8 Transcript Leader 4

09/03-23 - Face to face interview

P1 - 1 - Can you tell us a little bit about yourself and could you briefly describe your experience working in the logistics sector?

- Worked in the post office for 23 years and 6 years as a *** manager - responsible for all the cars and trucks within the terminal areas. Moves exchange containers in and out of the gate, collects and drives everything that goes on the train. 22 trucks and 60 drivers.

P2 - 3 - How familiar are you with Green Information Systems?

- In my unit we have followed everything that is environmentally friendly and that is to say I am familiar with the environmentally friendly systems related to my unit. We now use Euro 6 engines, which are the most environmentally friendly diesel engines. Furthermore, we have looked at EL trucks, but so far there is nothing that works for our use.

P2 - 4 - Could you give an example of a Green IS practice that has significantly impacted your organization's economic development and sustainability?

- It is a system that we are actually working on now. I have been asking for many years to create a system with a digital list to replace paper lists. This makes it more clear as we are dealing with many exchange containers that are constantly increasing. We also have a system implemented today that has a clear impact on sustainability. These are the Euro 6 engines we use to reduce emissions.

P3 - 5 - What is your overall attitude towards the implementation of green IS initiatives in logistics operations?

- I have a very positive attitude - love technology!

P3 - 6 - How does your organization balance the trade-offs between economic, environmental, and social concerns when making decisions?

- I don't have specific figures on the economy when it comes to whether the engines we use today are cheaper to operate, but for my part it is important to be environmentally friendly. Nor does it rule out that customers and external parties are helping to push to lead us in a more environmentally friendly direction.

P4 - 7 - In your experience, what gaps exist in the adoption of Green IS practices in the logistics industry?

- I have been asking for many years to create a system with a digital list that replaces lists on paper. This makes it more transparent as we deal with many swap containers that are constantly increasing due to the increase in volume through the years.

P4 - 8 - How do you think Green IS may help the logistics industry move toward more sustainable business practices?

- We have already implemented systems that contribute to environmental friendliness. For example, we have reports we can take out in relation to environmentally friendly driving and economical driving..

P4 - 9 - What obstacles do you see in implementing Green IS practices, and how could they be overcome?

- We previously had two systems that were developed externally with an attempt to improve efficiency and at the same time contribute to environmental friendliness through less use of paper. These have not worked favorably and were tested for two weeks. The obstacles are how these systems were designed - and who could gain access. Another obstacle has been integrating these systems with our existing systems. On the other hand, we are now working on getting a simplified version started that can help us.

P4 - 10 - How do you envision the role of logistics companies in achieving the UN Sustainable Development Goals related to the triple bottom line?

- I feel that *******, strongly supports these goals. If we compare this with other players, we are also quite early in implementing, for example, electric cars and environmentally friendly solutions.

P5 - 11 - Do you have any other remarks or questions?

9.9 Transcript Leader 5

09/03-23 - Face to face interview

P1 - 1 - Can you tell us a little bit about yourself and could you briefly describe your experience working in the logistics sector?

- I am 26 years old and have studied economics with logistics. I have now worked as manager of local mail for 1.5 years and a total of 7 years in the company. In my department, we sort goods and packages by postcode for Oslo and Viken.

P2 - 2 - How familiar are you with Green Information Systems?

- In my department, we use information systems within scanning called data driven. This system allows us to scan the package and find out which postcode

the package is going to. We also have various systems that focus on quality, sickness absence etc. To name a few systems, there are KOS and LMK.

P2 - 3 - Could you give an example of a Green IS practice that has significantly impacted your organization's economic development and sustainability?

- I would say that it is a system called data driven. Mostly this has had a financial benefit. Before this system, the employee had to remember their postcode - now everything is in the system. Here we save money on training - at the same time that we can use on-call substitutes more frequently. On the other hand, this system has helped the environment as we can easily identify and mark damaged packages. That way, the package will be able to go to a department that repairs the package.

P3 - 4 - What is your overall attitude towards the implementation of green IS initiatives in logistics operations?

- I have a positive attitude towards these systems. I like developing and testing new systems.

P3 - 5 - How does your organization balance the trade-offs between economic, environmental, and social concerns when making decisions?

- I think they do a good job. We can consider an example the company is currently working on. Here, work is being done on a solution where you can deliver mail and visit the elderly. In this way, the social aspect is taken care of. Furthermore, the environmental aspect is taken care of through the electrification of our car fleet. Here, we have already replaced a good number of vehicles with EL solutions - and are constantly working on electrifying the trucks.

P4 - 6 - In your experience, what gaps exist in the adoption of Green IS practices in the logistics industry?

- We use a lot of paper in our department. We replace around 2,000 sheets when we sort containers (postman). These get thrown everyday! I am not sure what is needed - but a system that could solve this.

P4 - 7 - How do you think Green IS may help the logistics industry move toward more sustainable business practices?

- In my department, I expect that green information systems could help logistics by using smaller sheets of paper - and then also save the rainforest.

P4 - 8 - What obstacles do you see in implementing Green IS practices, and how could they be overcome?

- I dont know..

P4 - 9 - How do you envision the role of logistics companies in achieving the UN Sustainable Development Goals related to the triple bottom line?

- *** has set out some goals that they are trying to achieve. Among other things, innovation and sustainability goals. Here, for example, the electrification of our car fleet is concerned.

P5 - 11 - Do you have any other remarks or questions?

- No

9.10 Transcript Leader 6 10/03-23 - Face to face interview

P1 - 1 - Can you tell us a little bit about yourself and could you briefly describe your experience working in the logistics sector?

- I am 31 years old and have worked here for almost 10-12 years. Started working as a technician - in other words, a maintenance engineer. Then took over the department in 2019 with a team of 14 - and has since been involved in developing new solutions, maintenance plans, how to operate the machines as best as possible, energy saving and other projects.

P2 - 2 - How familiar are you with Green Information Systems?

- I have become more and more familiar with systems and technology over the years. For example, registration systems, follow-up systems, LM, KOS, and other internal systems that we at *** have designed.

P2 - 3 - Could you give an example of a Green IS practice that has significantly impacted your organization's economic development and sustainability?

- In our department, for example, we have a system where we register the various jobs we carry out. In this way, we are able to follow up the work, look at developments and trends. The systems give us the opportunity to extract power data, load, prices of various parts etc. Furthermore, we have also developed QR codes on the various parts so that we can scan the part and connect it to the system. In this way, we have also automated parts of our warehouse.

P3 - 4 - What is your overall attitude towards the implementation of green IS initiatives in logistics operations?

- I am very positive about these systems as they have made our everyday life much better. We went from being chaotic to having structure after implementing these systems.

P3 - 5 - How does your organization balance the trade-offs between economic, environmental, and social concerns when making decisions?

- They balance them in a good way - but as a company the economy must always come first.

P4 - 6 - In your experience, what gaps exist in the adoption of Green IS practices in the logistics industry?

- Develop a system that gives us a complete live overview.

P4 - 8 - How do you think Green IS may help the logistics industry move toward more sustainable business practices?

- With the support we get from the management on the implementation of the various systems, I feel that we can contribute to sustainable business practices. If we take, for example, a new system we introduced, we were able to save 50% of electricity - expenses go down along with CO2 emissions. Furthermore, these systems can contribute to less wear and tear - which in turn means that the cars have fewer stops and fewer journeys. Less wear leads to fewer new parts and pollution of nature. For example, one of my employees is going on a 3D printing course - to see if we can make some of the spare parts we need.

P4 - 9 - What obstacles do you see in implementing Green IS practices, and how could they be overcome?

- There have been obstacles along the way as this is a getting used to process - both on the human and computer side. We have spent 3 years developing this system. I would say time has been the biggest obstacle.

P4 - 10 - How do you envision the role of logistics companies in achieving the UN Sustainable Development Goals related to the triple bottom line?

- We are, after all, a major player - and must therefore lead the way. If we do not lead by example, others will not follow. It also creates a positive reputation for us by being a role model!

P5 - 11 - Do you have any other remarks or questions?

- No, but I will let you know if there is later.

9.11 Transcript Leader 7 10/03-23 - Face to face interview

P1 - 1 - Can you tell us a little bit about yourself and could you briefly describe your experience working in the logistics sector?

- I am 45 years old, 3 children. Worked in the post office for 8 years and 5 years as manager. Production manager for main mailroom. This applies to all mail that is sorted and loaded to other mail terminals before being taken on to the end user.

P2 - 2 - How familiar are you with Green Information Systems?

- I would say that I am well acquainted with the systems we got specialised with inside the fields we are working at. As an example, we have a PDA scanning system that gathers all the information, so the worker does not need to

memorise everything anymore. Anyone can perform the job and the customer can track the shipments at the same time.

P2 - 3 - Could you give an example of a Green IS practice that has significantly impacted your organization's economic development and sustainability?

- I do not feel that there are any special systems in our department that have influenced economic development and sustainability. On the other hand, I was part of a first-line manager program. There we went through a project on loose loading. That is, how many packages we can load into a container before we send it off. I feel this has a more economic significance. The PDA system, on the other hand, I would say affects the service we provide to customers. We have a reporting system in our department where I can see how many packages we unload in each individual container. In my daily practice, I will get numbers and information on where we will send the parcels. Our department does not use that system - but as I understand it, it is not optimized yet. Furthermore, we also have another automated machine that both scans and distributes packages across the terminals. This machine and the system on which the machine is based provide the packages my department has to sort and send out.

P3 - 4 - What is your overall attitude towards the implementation of green IS initiatives in logistics operations?

- I am very positive about this as I feel it both develops the company and my team towards better results.

P3 - 5 - How does your organization balance the trade-offs between economic, environmental, and social concerns when making decisions?

- I feel like our organisation puts the social aspects first when we make decisions. Now I occupy a position where we can't just think about one isolated aspect – but again, this is very situational. For example, if technology were to emerge that replaces humans, it would require tough decisions. We are getting a new terminal at Moss, and this is close to Sweden. The decision of the location of this terminal affects both the environment making the process more efficient, the social creating job

opportunities in the area and the economic aspect, where we save money by cutting costs..

P4 - 6 - In your experience, what gaps exist in the adoption of Green IS practices in the logistics industry?

- I feel that technology can help our processes within the department go faster as there are people working here. There are people who put the packages on belts and cages. My Leader Jihad has traveled and looked at new innovative technology. For example, it could be a robot arm that sorts the packages. It will go faster and lead to fewer errors. I think this is the future.

P4 - 7 - How do you think Green IS may help the logistics industry move toward more sustainable business practices?

- If we consider my department - then we do not run electric cars between the terminals. Much of this is based on the fact that the technology has not been developed enough to be able to introduce these cars and trucks. Once this is developed, we will move towards a more sustainable business practice.

P4 - 8 - What obstacles do you see in implementing Green IS practices, and how could they be overcome?

- If we consider the automated arm, I feel that the technology is in the starting pit. Furthermore, it is also the case that *** has over time taken care to be very sure that it is the right technology that is implemented before they go for anything.

P4 - 9 - How do you envision the role of logistics companies in achieving the UN Sustainable Development Goals related to the triple bottom line?

- *** is the *** logistics company in the country - they are very keen to present themselves as market leaders within their industry. The last time I read this, our company was ahead.

P5 - 10 - Do you have any other remarks or questions?

9.12 Transcript Leader 8
10/03-23 - Face to face interview

P1 - 1 - Can you tell us a little bit about yourself and could you briefly describe your experience working in the logistics sector?

- Worked in the logistics industry for almost 12 years. Started as a regular employee, progressed to coordinator and now as temporary production manager.

P2 - 2 - How familiar are you with Green Information Systems?

- I have dealt with two departments. We use various systems such as, for example, registration of hours used, volume of how much we have driven, number of packages we have driven, preventing loads. These systems are called LMK and KOS, among others. These systems are used internally across the entire company.

P2 - 3- Could you give an example of a Green IS practice that has significantly impacted your organization's economic development and sustainability?

- We have a system called Auto Loader. It is a system that we have not implemented yet, but this is a more forward-looking and innovative solution as it makes production more efficient. We also have other systems that have been introduced today. For example, vacuum pumps that help us carry heavy packages. It has clearly affected the economy as we produce more.

P3 - 4 - What is your overall attitude towards the implementation of green IS initiatives in logistics operations?

- I have a positive attitude towards these systems and the company in general also has an welcoming attitude for new initiatives and innovative solutions.

P3 - 5 - How does your organization balance the trade-offs between economic, environmental, and social concerns when making decisions?

- I feel that the company has a good balance when it comes to these three factors. The management is also very open to including us managers in these major

decisions. For example, the Auto Loader system was introduced to us first-line managers - and we were given the opportunity to give our opinions and thoughts.

P4 - 6 - In your experience, what gaps exist in the adoption of Green IS practices in the logistics industry?

- My department is referred to as the heart of the post. It would have been nice to have a system with a counter that shows live how much an employee produces. Such a system could be helpful for the motivation of the individual employee.

P4 - 7 - How do you think Green IS may help the logistics industry move toward more sustainable business practices?

- When it comes to emissions, these systems will help considerably - and something we at *** take advantage of through the electric cars. The Auto Loader system will also be able to minimize the burden on the employees.

P4 - 8 - What obstacles do you see in implementing Green IS practices, and how could they be overcome?

- I feel like the reason could be economical — and that's why maybe similar systems are being postponed.

P4 - 9 - How do you envision the role of logistics companies in achieving the UN Sustainable Development Goals related to the triple bottom line?

- I feel that *** has positioned itself very well in relation to these goals as we are part of the problem - but also the solution. For example, we have a good EL car fleet and focus on optimizing space to avoid having to take extra trips.

P5 - 10 - Do you have any other remarks or questions?

9.13 Transcript Employee 1 03/04-23 - Face to face interview

P1 - 1 - Can you tell us a little bit about yourself?

- I am a 19-year-old student and have worked in this department for about 1 year. I chose to apply to this company because it is in the family. My mother works in the HR department - and has talked a lot about how good they are at developing people. Maybe I will get a better position after finishing my studies.

P1 - 2 - Could you briefly describe your experience working in the logistics sector?

- In the year I have worked here, I have enjoyed myself very much. Previously had no work experience within the logistics industry - but have learned a lot.

P2 - 3 - How familiar are you with Green Information Systems?

- Initially, I have no particular knowledge of it - but now that you have given me a little insight into what it was, I can say that I am somewhat familiar with it, but in a way do not quite know what it is.

A. Now that we have told you the difference between information systems and green information systems, has it given you a clearer picture?

- Yes, but I haven't heard of it until you mention it. I only have a general understanding that technology exists in my workplace and that our company has a high focus on technology and innovation.

P2 - 4 - Could you give an example of a Green IS practice that has significantly impacted your organization's economic development and sustainability?

- I don't know if there are green systems, but in our department we have a system that gives us information on if a package is stuck in the automated belt. We have a system on the iPad that shows us exactly where it is located - and we then run and straighten the package. I believe this has led to us being able to achieve our KPI and targets better, while at the same time giving us greater productivity and financial gain. I don't know exactly how it affects environmental friendliness - but I think it has some effect.

P3 - 5 - What is your overall attitude towards the implementation of green IS initiatives in logistics operations?

- I would say that I have a positive attitude towards this as I have seen in my short time in the company that the technology has only led to better productivity. Nor have I heard that others have complained about these systems. After all, I have only worked here for just under 1 year and only come across a few systems that are around my workplace.

P3 - 6 - How does your organization balance the trade-offs between economic, environmental, and social concerns when making decisions?

- As mentioned, I have only worked here for one year. There have been no new implementations in my time. Can't therefore say anything for sure about how they balance.

P4 - 7 - In your experience, what gaps exist in the adoption of Green IS practices in the logistics industry?

- I actually have an example. Now that I think about it, we could implement a system or a practice that enables us to sort sources better. Our department also spends a lot of time looking for packages that are missing - or packages that have not been marked correctly. We will throw away most letters after a certain time - and we don't have any good practice for that. Have noticed that the older employees do not sort sources correctly either.

P4 - 8 - How do you think Green IS may help the logistics industry move toward more sustainable business practices?

- I am not sure if my idea of a system could be implemented within our terminal areas due to the lack of space, but by sorting the damaged waste of packaging into renewable packaging. Just like the uniforms we were – which are based on renewable particles.

P4 - 9 - What obstacles do you see in implementing Green IS practices, and how could they be overcome?

- I don't really have a clear answer to this because I have never had the courage to come forward with my idea about source sorting to the company. Feels that it is the company that ultimately has insight into this. But surely must be something financially related.

P4 - 10 - How do you envision the role of logistics companies in achieving the UN Sustainable Development Goals related to the triple bottom line?

- I think they have to reach them, just as we all have a responsibility. It is not good enough to stand on the sidelines. Feel the company has really tried to reach them as I have seen they have won some awards.

P5 - 11 - Do you have any other remarks or questions?

- No, I feel I have answered what you have asked to the best of my ability.

9.14 Transcript Employee 3

03/04-23 - Face to face interview

P1 - 1 - Can you tell us a little bit about yourself?

- I am 27 years old and have worked in this company for almost 5 years. Started as a warehouse employee - but now has a coordinator position. My tasks consist of coordinating and delegating tasks to those I am responsible for, while at the same time making sure that the goals my manager has set are achieved. We have a somewhat unique job as we are always traveling around the terminal. We must ensure that all parts of the operation operate optimally - and that they have what they need to function.

P1 - 2 - Could you briefly describe your experience working in the logistics sector?

- During these 5 years, I have become more and more familiar with logistics - and how complex it really is and how many parts it consists of. After my interest increased, I reported to my manager and therefore got a placement in my current department.

P2 - 3 - How familiar are you with Green Information Systems?

- As my role involves being a bit all over the terminal, I have seen some of the systems in use. Don't have too much experience with them. After you have come up with the definition, I might notice that I don't know too much about it.

P2 - 4 - Could you give an example of a Green IS practice that has significantly impacted your organization's economic development and sustainability?

- Without a doubt, it is the system that gives us the opportunity to predict how many packages we will receive. I don't remember the name of what it was called again - but I think it was "computer driven". This means that before each shift we have an insight into which departments will feel the strain - and means that we are able to prioritize and allocate employees correctly.

P3 - 5 - What is your overall attitude towards the implementation of green IS initiatives in logistics operations?

- I am positive about new systems. It helps us develop - and I want to be a part of that.

P3 - 6 - How does your organization balance the trade-offs between economic, environmental, and social concerns when making decisions?

- It has been a long time since anything new has been implemented in our part of the company. But if we look at the company as a whole, I feel that the environmentally friendly is appreciated. I think this is also a lot of PR because our customers demand that we are environmentally friendly.

P4 - 7 - In your experience, what gaps exist in the adoption of Green IS practices in the logistics industry?

- A bit unsure, feel we have everything needed.

P4 - 8 - How do you think Green IS may help the logistics industry move toward more sustainable business practices?

- If we look, for example, at the electric cars the company has sourced, they have a very big impact on the environment. Believe with the development of technology that these systems will help our company even more.

P4 - 9 - What obstacles do you see in implementing Green IS practices, and how could they be overcome?

- When you mentioned automation earlier in the interview, I got some thoughts now. One of the reasons why complications can arise is if the systems that are implemented remove jobs. Then it may not be entirely certain that the employees will use the systems in a good way..

P4 - 10 - How do you envision the role of logistics companies in achieving the UN Sustainable Development Goals related to the triple bottom line?

- We have a big role to play. After I realized how many links a package goes through - and not least how far it travels, it increases our responsibility. I also think the company has positioned itself quite well.

P5 - 11 - Do you have any other remarks or questions?

- No

9.15 Transcript Employee 5 03/04-23 - Face to face interview

P1 - 1 - Can you tell us a little bit about yourself?

- I am a 44-year-old man and have been working as a driver for almost 12 years. Always liked to drive. Got this job by accident. I was initially a cook, but when the restaurant I worked with needed drivers, I volunteered. From there, the journey has continued and today I work at the company.

P1 - 2 - Could you briefly describe your experience working in the logistics sector?

- I have worked with logistics and heavy vehicles for almost 8 years. I feel very comfortable as we drivers have been given good conditions. There is a

shortage of us - so the company does everything to arrange the best circumstances for us.

P2 - 3 - How familiar are you with Green Information Systems?

- Heard of these, but never really knew what they were. For example, we do not drive electric trucks and do not have access to the reports that the electric trucks issue. We are a little behind in this as there are no systems that suit our department.

P2 - 4 - Could you give an example of a Green IS practice that has significantly impacted your organization's economic development and sustainability?

- I don't know about anyone in our department, but know that the electric small trucks have helped a lot. Beyond that, I have no idea about this. As a driver, I am responsible for driving goods between the terminals and ensure that I carry out this work well.

P3 - 5 - What is your overall attitude towards the implementation of green IS initiatives in logistics operations?

- If these systems allow me to have better working conditions, I have a positive attitude. As long as there isn't a system that makes it harder for me.

P3 - 6 - How does your organization balance the trade-offs between economic, environmental, and social concerns when making decisions?

- No idea.

P4 - 7 - In your experience, what gaps exist in the adoption of Green IS practices in the logistics industry?

- I think it's the technology. In my department, we are dependent on transporting heavy loads over long distances. Last time I updated about this, it didn't exist. I also think my immediate manager and the company would have implemented it if it was possible. I think it was something with charging stations too, a bit unsure.

P4 - 8 - How do you think Green IS may help the logistics industry move toward more sustainable business practices?

- The effect of electrification seems to be high, so believe that these systems can help our company and others very positively.

P4 - 9 - What obstacles do you see in implementing Green IS practices, and how could they be overcome?

- So, the leaders tried putting in place several different systems. But we found that this one did not go as planned. The teaching wasn't good enough for people to learn how to use it and see its benefits. We were basically told to learn by doing, which caused a lot of trouble and was a major setback for the project

P4 - 10 - How do you envision the role of logistics companies in achieving the UN Sustainable Development Goals related to the triple bottom line?

- I, who drive so much, have to say that I feel that I contribute to polluting - and as part of a larger company, I think that the company has a role in reaching these goals. If they reach the targets, they will perhaps clear my conscience a little - I drive because I have to.

P5 - 11 - Do you have any other remarks or questions?

- No, I feel I have answered everything.

9.16 Transcript Employee 7

04/04-23 - Face to face interview

P1 - 1 - Can you tell us a little bit about yourself?

- I work as a call representative in the department called Operations Close Support. In this department is responsible for preparing cages for drivers who drive them on to the delivery points. I have chosen this department as I like high pressure and activity as it allows time to pass.

P1 - 2 - Could you briefly describe your experience working in the logistics sector?

- I am 28 years old now and have worked here for about 8 years. Before this I worked in another logistics company - and have a total of 8 years of logistics experience. During these 8 years, I have developed and gained a taste for the job. I

aim to become a coordinator in my department - and am therefore always looking to learn and make suggestions.

P2 - 3 - How familiar are you with Green Information Systems?

- Have come across some such systems, but do not feel that we have implemented any of them in our department. After you have explained the difference between the green and normal information systems, I feel that we have more information systems and not necessarily green. The systems in our company are mostly looking for efficiency in production so that we send as many packages as possible in the shortest time.

P2 - 4 - Could you give an example of a Green IS practice that has significantly impacted your organization's economic development and sustainability?

- For me it's PDA scanners. I wear a glow and a PDA scanner. I assume that the company saves money by decreasing staff by scanning packages quickly

P3 - 5 - What is your overall attitude towards the implementation of green IS initiatives in logistics operations?

- I am very fond of technology and systems in general. I would have liked to see us implement more green information systems in the near future.

P3 - 6 - How does your organization balance the trade-offs between economic, environmental, and social concerns when making decisions?

- As most of the systems I've come across in the last 5 years have been implemented for productivity and efficiency, I'd say it's financially motivated. On the other hand, we can also see that the company has a large investment in electric cars - perhaps it shows that they pay some attention to environmentally friendly aspects.

P4 - 7 - In your experience, what gaps exist in the adoption of Green IS practices in the logistics industry?

- I see a big difference in how things may be done in my area. I have no idea how many papers I print and throw away each day. We use the papers to label the

different cages we have. There should be a way to do this that is better. Maybe switch them with an electronic board.

P4 - 8 - How do you think Green IS may help the logistics industry move toward more sustainable business practices?

- So, we don't drive electric cars between the terminals. Much of this is because the technology has not been developed enough to introduce these cars and trucks. It's not always viable to charge the cars between trips, it's time consuming and we would need to change to longer routes to find these charging stations. Once this is developed, we will move towards more sustainable business practices.

P4 - 9 - What obstacles do you see in implementing Green IS practices, and how could they be overcome?

- The biggest obstacle is perhaps that our part of the company does not have a group that tries to come up with solutions. I know that we on the "floor" do not have a voice here - so the responsibility lies with the leaders. I don't know much more I can say at this point.

P4 - 10 - How do you envision the role of logistics companies in achieving the UN Sustainable Development Goals related to the triple bottom line?

- As a logistics company, it has a large network and leaves a large footprint. Even if they only operate because it is the customers who order, they have a responsibility to contribute to these goals you are talking about.

P5 - 11 - Do you have any other remarks or questions?

- No.

9.17 Transcript Employee 9

04/04-23 - Face to face interview

P1 - 1 - Can you tell us a little bit about yourself?

- I am a qualified mechanical engineer - and have extensive experience within industrial machines. I started working for this company about 9 years ago.

P1 - 2 - Could you briefly describe your experience working in the logistics sector?

- As mentioned, I started at the post about 9 years ago. I have always worked with large machines in industry and facilitated maintenance. When I came across this position, I applied immediately because I wanted new challenges. I was informed that they had received a large automated machine and needed someone to handle the maintenance of these.

P2 - 3 - How familiar are you with Green Information Systems?

- I am somewhat familiar. We use systems to map maintenance and locate maintenance. My immediate manager always pushes for new ideas.

P2 - 4 - Could you give an example of a Green IS practice that has significantly impacted your organization's economic development and sustainability?

- Yes, we implemented a system that reduced our energy consumption tremendously! I will qualify this within green information systems. Also reckons that the top management is satisfied with that saving.

P3 - 5 - What is your overall attitude towards the implementation of green IS initiatives in logistics operations?

- I do think that it is positive that the company is trying to become more green. So naturally I think it's great that they are looking to implement more of those Green Information systems.

P3 - 6 - How does your organization balance the trade-offs between economic, environmental, and social concerns when making decisions?

- I do think that they are continuously trying to balance it out, however, the most significant and visible part is the economy. This can be seen by our work load, the emphasis on effective working and so on. It seems like we always need to be working while keeping revenues at first priority.

Hva er viktigst for deg?

- Personally I can see why the economic aspect is important. But as an employee I also value the social. The workplace is best when the people are right, and

I also feel more welcome. Also, the environmental aspect is important for me as we all play a part in the world's environment and have a responsibility.

P4 - 7 - In your experience, what gaps exist in the adoption of Green IS practices in the logistics industry?

- I think it goes a little bit into reusing broken equipment. My manager has been to some seminars where they talk about circular economy and how we can use and repair broken parts. Technology must evolve.

P4 - 8 - How do you think Green IS may help the logistics industry move toward more sustainable business practices?

- Have great faith in this. Especially after we saw how our new system of energy and power saving helped the company greatly.

P4 - 9 - What obstacles do you see in implementing Green IS practices, and how could they be overcome?

- Teknologiutviklingen og økt inkludering av ansatte. I min avdeling er det litt mer åpent ettersom vi jobber for dette. Lederen min er aktiv med å inkludere oss. I andre avdelinger seg at medarbeiderne nærmeste jobber kun på rutine.

P4 - 10 - How do you envision the role of logistics companies in achieving the UN Sustainable Development Goals related to the triple bottom line?

- I think that they will play a large part in the goals. I know that logistics and transport of goods are rising, and also the emission it causes. Therefore companies in this branch have a great responsibility to meet certain demands. The UN goals is great as it causes organizations to think ahead and understand the negative impacts they make, and also motivates them to do something about it.

P5 - 11 - Do you have any other remarks or questions?

- No, I have nothing more.

9.18 Transcript Employee 11

05/04-23 - Face to face interview

P1 - 1 - Can you tell us a little bit about yourself?

- My name is *** and I have worked in *** for almost 7 years now. In my department, there is always a lot to do, so I spend my free time completely relaxing.

P1 - 2 - Could you briefly describe your experience working in the logistics sector?

- It has now been almost 7 years in the logistics industry. Started as a temporary worker before I was offered a permanent position - which I agreed to straight away. Not often do we get this opportunity. So far I am satisfied - but of course I want to climb the ladder. Been doing this for quite a while now and it's a lot of routine work. Motivation is not always at its peak.

P2 - 3 - How familiar are you with Green Information Systems?

- Well, now that you describe what it is, I don't feel like I'm familiar with it.

P2 - 4 - Could you give an example of a Green IS practice that has significantly impacted your organization's economic development and sustainability?

- My task is to carry parcels from conveyor belts into the trucks. Right there, we don't have any systems, but the tape the packages go through I think has affected the company financially. There is a large automated machine that sorts packages for us and arranges them so that they end up in the right belt. It has certainly helped the company a lot financially. The downside is that it has removed some jobs, but that's the way it has to be.

P3 - 5 - What is your overall attitude towards the implementation of green IS initiatives in logistics operations?

- Have a positive attitude as long as my job gets easier - and that I don't lose it!

P3 - 6 - How does your organization balance the trade-offs between economic, environmental, and social concerns when making decisions?

- Without thinking too much about it, I think they prioritize the financial even if they try to portray themselves as environmentally friendly.

What is most important to you?

- For my part, it is that it does not interfere with my work. There is too much talk about environmental friendliness and sustainability, but where is the social part, I ask myself. Must then be social followed by the economic and the environment in the end.

P4 - 7 - In your experience, what gaps exist in the adoption of Green IS practices in the logistics industry?

- Hehe, the solution I'm sitting with means I'll lose my job. It is whether they bring in robots or some automated system that enables the packages to be loaded into the trucks themselves. Glad that technology hasn't caught on yet!

P4 - 8 - How do you think Green IS may help the logistics industry move toward more sustainable business practices?

- There is no doubt that it can help sustainability. But - feel that there must be a solution or that the management takes and introduces these systems where we employees are taken into account.

P4 - 9 - What obstacles do you see in implementing Green IS practices, and how could they be overcome?

- The technology I would say There is no doubt that it can help sustainability. But - feel that there must be a solution or that the management takes and introduces these systems where we employees are taken into account. biggest obstacle - things have not been developed. But it will! In the past, 500 MB of memory was a lot. Now they have several gigabytes on a small memory chip!

P4 - 10 - How do you envision the role of logistics companies in achieving the UN Sustainable Development Goals related to the triple bottom line?

- Don't know what they are or what they involve even though you mention them. But the company probably has to deal with them, yes.

P5 - 11 - Do you have any other remarks or questions?

- No, that was all.

9.19 Transcript Employee 13

05/04-23 - Face to face interview

P1 - 1 - Can you tell us a little bit about yourself?

- I have now been with the company for 7 years. Has been good at school, and has therefore worked in many different places in life. I started working at the company after I heard your internal programs on how they develop people and offer careers. Attended some of these programmes, and now have a coordinator position.

P1 - 2 - Could you briefly describe your experience working in the logistics sector?

- In total, I have 13 years of experience in the logistics industry. There are always new things to learn as I have witnessed many changes and seen how the company adapts to the changes. I would therefore like to say that I have broad experience in this industry. I also worked at the competitor before I started here. Sees big differences in how they operate - and uses that as motivation in a working day that usually consists of doing the same thing over and over again.

P2 - 3 - How familiar are you with Green Information Systems?

- To be honest, I do not have a deeper understanding on how these systems work. My familiarity with the systems extends only upon the systems we use near my workplace. However, I am willing to learn more about these systems and expand my knowledge in this field.

P2 - 4 - Could you give an example of a Green IS practice that has significantly impacted your organization's economic development and sustainability?

- In the department I work in, there is no system that I would say has done that. But know that there have been systems in other departments that have had a significant impact on the environment. For example, electric cars and the fully automated terminal they are building.

P3 - 5 - What is your overall attitude towards the implementation of green IS initiatives in logistics operations?

- Very positive as I feel that technology is needed for us to develop. Both as people and as a company.

P3 - 6 - How does your organization balance the trade-offs between economic, environmental, and social concerns when making decisions?

- Good question. Had a conversation with my manager when we talked about the automated terminal. I said that such innovations are important, but it has created some fear for us employees internally. Especially me as a coordinator who talks a lot with the employees. In other words, the company thinks mostly about the financial side.

Hva er viktigst for deg?

- As I also mentioned to my manager, the social aspect must be prioritized. If we see that, for example, the company introduces automation and causes some positions to disappear, it is important to make arrangements for them.

P4 - 7 - In your experience, what gaps exist in the adoption of Green IS practices in the logistics industry?

- Don't know much about it.

P4 - 8 - How do you think Green IS may help the logistics industry move toward more sustainable business practices?

- Will help the company primarily through the electrification of vehicles that have a smaller footprint.

P4 - 9 - What obstacles do you see in implementing Green IS practices, and how could they be overcome?

- We talked about the social aspect and the fear I saw from my co-workers. Maybe including us and having open communication will help?

P4 - 10 - How do you envision the role of logistics companies in achieving the UN Sustainable Development Goals related to the triple bottom line?

- Not quite my field.

P5 - 11 - Do you have any other remarks or questions?

- No, but let me know by email if there is anything.

9.20 Themes from Interviews

	Leader 1	Leader 2	Leader 3	Leader 4	Leader 5	Leader 6	Leader 7	Leader 8	Our conclusion
P2 - 2 - How familiar are you with Green Information Systems?	I would say that I am very familiar with Green Information Systems and the systems we use in general, that could be all of our management systems tools such as SAS and other internal systems that the company has itself designed after a long internal discussion, we ordered a system from China, but the drivers did not know how to use it, so we had to change them to iPads where they bring in the truck and have access in real time to the shipments log.	I am familiar with some information systems. For example, we use a system called LMK. This system gives us information about the package when we scan it.	I am not very familiar with the "green" information systems - but have insight into some systems that were with the change from machine to automation. Furthermore, when I worked with IT in a company that was acquired by ***, we used systems. Here we used two production systems and various mail and BackOffice.	In my unit we have followed everything that is environmentally friendly and that is, to say I am familiar with the environmentally friendly systems related to my unit. We now use Euro 6 engines, which are the most environmentally friendly diesel engines. Furthermore, we have looked at EL trucks, but so far there is nothing that works for our use.	In my department, we use information systems within scanning called data driven. This system allows us to scan the package and find out which postcode the package is going to. We also have various systems that focus on quality, sickness absence etc. To name a few systems, there are KOS and LMK.	I've become more and more familiar with our systems and technology over the years. We have for example: systems for registration, follow-up, "LM", "KOS", and other internal systems we have designed.	I would say that I am well acquainted with the systems we got specialised with inside the fields we are working at. As an example, we have a PDA scanning system that gathers all the information, so the worker does not need to memorize everything anymore. Anyone can perform the job and the customer can track the shipments at the same time.	I have dealt with two departments. We use various systems such as, for example, registration of hours used, volume of how much we have driven, number of packages we have driven, preventing loads. These systems are called LMK and KOS. These systems are used internally across the entire company.	The participants seemed to have pretty good knowledge of different systems. Provided examples. SAS, LMK, INTERNAL SYSTEMS, KOS, PDA. Mostly systems related to productivity and efficiency.
P2 - 3 - Could you give an example of a Green IS practice that has significantly impacted your organization's economic development and sustainability?	I would say the most resourceful systems we use are the ones that give us forecasts. These systems allow us to be able to plan accordingly, so that we use the right resources against the right volume. For example, we are able to map the use of the right number of employees, so we can adequate it to the correct amount of work, and also the right number of cars	Yes, we changed a system which made a big difference. Previously we used a program called CONCEILER for LMK. Our VIP customers used CONCEILER which led to large costs for the mail. *** implemented and developed a separate system called LMK.	Yes, anything that means you don't have to register things several times has given us economic development and sustainability. These systems have contributed to this. Everything from invoice systems, customs clearance points that have made our work more efficient. Furthermore, we	It is a system that we are actually working on now. I have been asking for many years to create a system with a digital list to replace paper lists. This makes it more clear as we are dealing with many exchange containers that are constantly increasing. We also have a system implemented today that has a clear impact on	I would say that it is a system called data driven. Mostly this has had a financial benefit. Before this system, the employee had to remember their postcode - now everything is in the system. Here we save money on training - at the same time, that we can use on-call substitutes more frequently. On	In our department, for example, we have a system where we register the various jobs we carry out. In this way, we are able to follow up the work, look at developments and trends. The systems give us the opportunity to extract power data, load, prices of various parts etc.	I do not feel that there are any special systems in our department that have influenced economic development and sustainability. On the other hand, I was part of a first-line manager program. There we went through a project on loose loading. That is, how many packages we can load into a container before we	We have a system called Auto Loader. It is a system that we have not implemented yet, but this is a more forward-looking and innovative solution as it makes production more efficient. We also have other systems that have been introduced today. For example, vacuum pumps that help us carry heavy packages. It has clearly affected the	Participants had clear overview of the systems and how they work. Productivity and efficiency still a trend. Higher focus on the economy, but still consider environment

	used to deliver and optimise the trips.		also have sorting systems that tell the worker where the cage should be and how much the package weighs so that he can stack it correctly	sustainability. These are the Euro 6 engines we use to reduce emissions.	the other hand, this system has helped the environment as we can easily identify and mark damaged packages.	Furthermore, we have also developed QR codes on the various parts so that we can scan the part and connect it to the system. In this way, we have also automated parts of our warehouse.	send it off. I feel this has a more economic significance. The PDA system, on the other hand, I would say affects the service we provide to customers. We have a reporting system in our department where I can see how many packages we unload in each individual container. In my daily practice, I will get numbers and information on where we will send the parcels. Our department does not use that system - but as I understand it, it is not optimized yet. Furthermore, we also have another automated machine that both scans and distributes packages across the terminals. This machine and the system on which the machine is based provide the packages my department has to sort and send out.	economy as we produce more.	in some degree.
P3 - 4 - What is your overall attitude towards the implementation of green IS	Have a positive attitude towards this as soon as the quality of the data is good. By quality, I mean whether the data is	I have a positive attitude towards information systems as we primarily help develop our own	My position on this is that it makes sense to implement these systems. It is not a threat to those	I have a very positive attitude - love technology!	I have a positive attitude towards these systems. I like developing and testing new systems.	I am very positive about these systems as they have made our everyday life	I am very positive about this as I feel it both develops the company and my team towards better results.	I have a positive attitude towards these systems and the company in general also has an welcoming attitude	A clear pattern on how positive they are.

initiatives in logistics operations?	accurate. The design of the system and how it's user-friendly is just a plus.	systems. This leads to easier acceptance and use for us.	who work here, rather it contributes to more efficient and interesting tasks being carried out.			much better. We went from being chaotic to having structure after implementing these systems.		for new initiatives and innovative solutions.	Also some interesting comments on how they have internal development. Again mentioning productivity and efficiency.
P3 - 5 - How does your organization balance the trade-offs between economic, environmental, and social concerns when making decisions?	If we take a further example where there is a technology that, for example, removes the need for five employees. First and foremost, technology won't cause the five employees to lose their jobs at once. Our company will highlight social concerns and allocate them to new jobs instead of recruiting new people to the other sectors that will increase with the higher productivity after the automatization.	One thinks of the economy where a man works. If we take the example of the LMK program we implemented, I would say that the company made a choice based on economy and simplification.	I feel that the company is very honest and fact-oriented when making decisions.	I don't have specific figures on the economy when it comes to whether the engines we use today are cheaper to operate, but for my part it is important to be environmentally friendly. Nor does it rule out that customers and external parties are helping to push to lead us in a more environmentally friendly direction.	I think they do a good job. We can consider an example the company is currently working on. Here, work is being done on a solution where you can deliver mail and visit the elderly. In this way, the social aspect is taken care of. Furthermore, the environmental aspect is taken care of through the electrification of our car fleet. Here, we have already replaced a good number of vehicles with EL solutions - and are constantly working on electrifying the trucks.	They balance them in a good way - but as a company the economy must always come first.	I feel like our organization puts the social aspects first when we make decisions. Now I occupy a position where we can't just think about one isolated aspect - but again, this is very situational. For example, if technology were to emerge that replaces humans, it would require tough decisions. We are getting a new terminal at Moss, and this is close to Sweden. The decision of the location of this terminal affects both the environment making the process more efficient, the social creating job opportunities in the area and the economic aspect, where we save	I feel that the company has a good balance when it comes to these three factors. The management is also very open to including us managers in these major decisions. For example, the Auto Loader system was introduced to us first-line managers - and we were given the opportunity to give our opinions and thoughts.	Overall, the participants seemed to think their company balance them good. On the other hand, we see that the examples they provide highlight focus on economic factors related to productivity and efficiency.

							money by cutting costs.		
P4 - 7 - In your experience, what gaps exist in the adoption of Green IS practices in the logistics industry?	I feel we have all the systems we need. There is no 'gap' in the introduction of green information systems which means that we have not implemented more.	We carry out some manual work where we physically scan the packages when they arrive at our department. I could imagine that when a package arrives at my department, this process will be automated through, for example, a machine that scans and prints out the label in advance.	In the unit I come from now, I don't feel that there are any new systems that could have been introduced. But in relation to sorting technology, we have implemented a system this autumn, but like other things it takes time before the system is optimized.	I have been asking for many years to create a system with a digital list that replaces lists on paper. This makes it more transparent as we deal with many swap containers that are constantly increasing due to the increase in volume through the years.	We use a lot of paper in our department. We replace around 2,000 sheets when we sort containers (postman). These get thrown everyday! I am not sure what is needed - but a system that could solve this.	Develop a system that gives us a complete live overview.	Technology can help our processes within the department go faster as there are people working here. There are people who put the packages on belts and cages. My Leader *** has traveled and looked at new innovative technology. For example, it could be a robot arm that sorts the packages. It will go faster and lead to fewer errors. I think this is the future.	My department is referred to as the heart of the post. It would have been nice to have a system with a counter that shows live how much an employee produces. Such a system could be helpful for the motivation of the individual employee.	Some of them did not think it was gap - due to the fact they don't think new systems could make their work better. Others provided examples on how new systems could make their work more productive.
P4 - 8 - How do you think Green IS may help the logistics industry move toward more sustainable business practices?	For example, if we take a new system that we introduced, we manage to save 50% of electricity costs - expenses went down along with CO2 emissions. Furthermore, these systems contribute to less deterioration and depreciation - which resulted in our cars having fewer stops and fewer trip.	30 years ago, we manually entered all postcodes into the system when sorting the package. Now everything is automated as our new machines have integrated scanners and read the information. I feel that this development and information systems in general can contribute to a more sustainable business practice.	These systems help us to spend less time on training and more use of substitutes as the information is in the systems. There must also be capacity optimization when it comes to filling up the units and driving as little empty as possible.	We have already implemented systems that contribute to environmental friendliness. For example, we have reports we can take out in relation to environmentally friendly driving and economical driving.	In my department, I expect that green information systems could help logistics by using smaller sheets of paper - and then also save the rainforest.	With the support we get from the management on the implementation of the various systems, I feel that we can contribute to sustainable business practices. If we take, for example, a new system we introduced, we were able to save 50% of electricity - expenses go down along with CO2	If we consider my department - then we do not run electric cars between the terminals. Much of this is based on the fact that the technology has not been developed enough to be able to introduce these cars and trucks. Once this is developed, we will move towards a more sustainable business practice.	When it comes to emissions, these systems will help considerably - and something we at *** take advantage of through the electric cars. The Auto Loader system will also be able to minimize the burden on the employees.	Automation and digitalization highlighted. Reducing CO2 Optimization Helping the environment. Support from management. Lack of technology. In conclusion, they provided some examples

						emissions. Furthermore, these systems can contribute to less wear and tear - which in turn means that the cars have fewer stops and fewer journeys. Less wear leads to fewer new parts and pollution of nature. For example, one of my employees is going on a 3D printing course - to see if we can make some of the spare parts we need.			mostly tied back to efficiency and productivity again.
P4 - 9 - What obstacles do you see in implementing Green IS practices, and how could they be overcome?	I would say that it is not the systems themselves that are obstacles, but external factors over which we in our company do have control and, in some cases, internal factors within finance.	I feel like the technology doesn't exist and that's why we haven't introduced this. Our company is very open to new ideas. As long as the technology and the proposal can be well justified and consistent with the investment made on it, I believe it will be introduced	It's the mentality. I think that there are no obstacles in the technology - but more the skepticism of people who will handle these systems.	We previously had two systems that were developed externally with an attempt to improve efficiency and at the same time contribute to environmental friendliness through less use of paper. These have not worked favorably and were tested for two weeks. The obstacles are how these systems were designed - and who could gain access. Another obstacle has been	I don't know.	There have been obstacles along the way as this is a getting used to process - both on the human and computer side. We have spent 3 years developing this system. I would say time has been the biggest obstacle.	If we consider the automated arm, I feel that the technology is in the starting pit. Furthermore, it is also the case that *** has over time taken care to be very sure that it is the right technology that is implemented before they go for anything.	I feel like the reason could be economical - and that's why maybe similar systems are being postponed.	External factors Lack of technology Economic factors Bad design Overall, the participants seemed to have ideas on how they could overcome the obstacles.

				integrating these systems with our existing systems. On the other hand, we are now working on getting a simplified version started that can help us.					
P4 - 10 - How do you envision the role of logistics companies in achieving the UN Sustainable Development Goals related to the triple bottom line?	*** has selected certain UN sustainability targets and introduced them internally in the company jg.qcder.lq achieve the targets. You can, for example, find the *** sustainability goals report which is publicly available. Here you will find different ways *** works to achieve these goals, as we, as a leading player in the market, have an important role - and not least to be a role model.	I thought that *** should act as a role model - and other companies look up to us. We talk about this further at our management meetings and shift meetings.	*** and *** can contribute with efficient routes and use non-polluting means of transport.	I feel that *** strongly supports these goals. If we compare this with other players, we are also quite early in implementing, for example, electric cars and environmentally friendly solutions.	*** has set out some goals that they are trying to achieve. Among other things, innovation and sustainability goals. Here, for example, the electrification of our car fleet is concerned.	We are, after all, a major player - and must therefore lead the way. If we do not lead by example, others will not follow. It also creates a positive reputation for us by being a role model!	*** is the *** logistics company in the country - they are very keen to present themselves as market leaders within their industry. The last time I read this, our company was ahead.	I feel that *** has positioned itself very well in relation to these goals as we are part of the problem - but also the solution. For example, we have a good EL car fleet and focus on optimizing space to avoid having to take extra trips.	Participants feel their company is a market leader and have positioned them well in accordance with the UN Goals.

9.21 Overview of Main Literature

Articles:	Year	Country	Journal / Conf Framework	Methodology	Empiric / Non-Empiric
Sustainability-oriented Innovation: A Systematic Review	2015		International Journal of Management Reviews		
Preferences for autonomous and alternative fuel-powered heavy-duty trucks in Germany	2020	Germany	Transportation Research Part D: Transport and Environment		
Technical and Business Aspects of Battery Electric Trucks – A Systematic Review	2022	Germany	Transportation Planning and Technology		
Urban Freight Last Mile Logistics – Challenges and Opportunities to Improve Sustainability: A Literature Review	2020	Sweden	Sustainable Transportation		
The future of transportation in sustainable energy systems: Opportunities and barriers in a clean energy transition	2018	Denmark	Renewable and Sustainable Energy Reviews		
Evaluation of Key Performance Indicators of Logistics Firms	2020	Turkey	Logistics & Sustainable Transport		
Reviewing Truck Logistics: Solutions for Achieving Low Emission Road Freight Transport	2020	Finland	Sustainable Mobility and Transport		
Impact of Reverse Logistics Product Disposition towards Business Performance in Malaysian E&E Companies	2011	Malaysia	Conference: 18th International Business Information Management Conference (IBIMA)		
Conceptualizing the circular economy: An analysis of 114 definitions	2017	Netherlands	Resources, Conservation and Recycling		
The potential of electric trucks – An international commodity-level analysis	2019	Switzerland	Applied Energy		
Environmental auditing in logistics and freight transportation: A literature review and research agenda	2014	Italy	Journal of Manufacturing Technology Management		
Product-level carbon auditing of supply chains: Environmental imperative or wasteful distraction?	2020	United Kingdom	International Journal of Physical Distribution & Logistics Management		
A Systematic Literature Review of Green and Sustainable Logistics: Bibliometric Analysis, Research Trend and Knowledge Taxonomy	2020	China	International Jour science mapping approach	Systematic Literature review	Empiric
Does a battery electric truck make a difference? – Life cycle emissions, costs, and externalities analysis of alternative fuel-powered Class 8 heavy-duty trucks in the United States	2017	United States	Journal of Cleaner Production		
Spatial and dynamic energy demand of the E30 highway – Implications on electrification options	2017	Sweden	Applied Energy		
The electric vehicle promotion in the cold-chain logistics under two-sided support policy: An evolutionary game perspective	2022	China	Transport Policy		
The potential of electric trucks – An international commodity-level analysis	2019	Switzerland	Applied Energy		
Smart logistics will transform trucking through unprecedented efficiency					
A methodology to evaluate the competitiveness of electric delivery trucks	2013	United States	Transportation Research Part E: Logistics and Transportation Review		
Greenhouse gas emissions from transport in Europe					
The "Biggest Failures by Industry in 2022, as Ranked in Five Research"					
Hierarchical Control of Megawatt-Scale Charging Stations for Electric Trucks with Distributed Energy Resources	2022	United States	IEEE Transactions on Industrial Electronics		
The world is now only 8.6% circular - CDP 2023 - Circularity Gap Reporting Initiative					
Green supply-chain management: A state-of-the-art literature review	2007	India	International Journal of Management Reviews	Systematic Literature review	Non-Empiric
Green information system integration for environmental performance in organizations: An extension of belief-action-outcome framework and natural resource-based view theory	2019	Malaysia	Benchmarking: A belief-action-outcome	Systematic Literature review	Empiric
Pro-Environmental Behavior and Green Information Systems Research: Review, Synthesis and Directions for Future Research	2016	Germany	Conference: 38th International Conference on Information Systems (ICIS), San Francisco (USA), December 13 - 16, 2016; San Francisco (USA) Authors	Systematic Literature review	Non-Empiric
Information Systems Innovation for Environmental Sustainability	2000	United States	MIS Quarterly		
Development of an instrument to Measure the Perceptions of Adopting an Information Technology Innovation	1991	United States	Information Systems Research		
Why organizations adopt information system process innovations: a longitudinal study using Diffusion of Innovation theory	2013	Finland	Information Systems Journal		
Green supply-of-Reverse logistics: white paper management: A state-of-the-art literature review	2007	India	International Journal of Management Reviews		
Unpacking Green IT: A Review of the Existing Literature	2015	Peru	Conference Sustainable IT Collaboration Around the Globe: 16th Americas Conference on Information Systems, AMCIS 2010, Lima, Peru, August 12-15, 2010	systematic literature review	Non-Empiric
From green to sustainability: Information Technology and an integrated sustainability framework	2011	United States	The Journal of Strategic Information Systems	design science	Non-Empiric
Senior managers' perception on green information systems (GIS) adoption and environmental performance: Results from a field survey	2013	United Kingdom	Information & Management	Survey	Empiric
A literature review on environmental concerns in logistics: trends and future challenges	2020	Malaysia	International Journal of Logistics		
Strategic Information Systems Provided: A Study in Sustainability and Performance	1994	United States	MIS Quarterly		
Information Systems Innovation for Environmental Sustainability	2010	United States	MIS Quarterly		
Fleet management: A vehicle and driver assignment model	2019	Portugal	European Journal of Operational Research		
Green logistics and circular economy	2019	Poland	Transportation Research Procedia	Case Study	Non-Empiric
Green IS Research: A Modernity Perspective	2016	Canada	Communications of the Association for Information Systems	Design Science	Non-Empiric
Green IS: Building Sustainable Business Practices	2014	United States		theoretical framework develp	Non-Empiric
Survey of Green Vehicle Routing Problems: Past and future trends	2013	China	Expert Systems with Applications	Survey	Non-Empiric
Motivating Energy-Efficient Behavior with Green IS: An Investigation of Goal Setting and the Role of Defaults	2013	United States	MIS Quarterly	Field Experiment	Empiric
Green supply-chain management: A state-of-the-art literature review	2007	India	International Journal of Management Reviews		
Green IS	2010	liechtenstein	Business & Information Systems Engineering		
Corporate ecological Responsiveness, Environmental Ambidexterity and IT-Enabled Environmental sustainability Strategy	2013	United States	Conference: Proceedings of the International Conference on Information Systems, ICIS 2010, Saint Louis, Missouri, USA, December 12-16, 2010		
*Strategy & society: The link between competitive advantage and corporate social responsibility	2006	United States	Strategy & Society		
What is Logistics Management? Understanding its Importance	2019	United States	SUPPLY CHAIN AND LOGISTICS MANAGEMENT		
A systematic review of Green Business Process Management	2019	Japan	Business Process Management Journal	systematic literature review	Non-Empiric
Leveraging Green IS in Logistics	2013	Germany	Business & Information Systems Engineering	Design Science Research	Empiric
Green information technology in logistics enterprise	2013	Poland	Polish journal of management studies	case study	Non-Empiric
Towards a reference architecture for fuel-based carbon management systems in the logistics industry	2013	Netherlands	Information Systems Frontiers	Design Science Research	Empiric
The Role of ICT in Green Logistics: A Systematic Literature Review	2014	Germany	Environmental Science and Engineering	case study	Non-Empiric
Green Logistics management and performance in Thailand's logistic enterprises	2016	Japan	IEEE International Conference on Industrial Technology (ICIT)	systematic literature review	Non-Empiric
Overview of PFED Technology Based on Green Logistics in China	2014	China	Applied Mechanics and Materials		
Information Systems and Reverse Logistics: Promise for Future?	2015	France	International Conference on Circuits and Systems	Secondary data analysis	Non-Empiric
SUSTAINABLE CONCEPT FOR GREEN LOGISTICS AND ENERGY EFFICIENCY IN MANUFACTURING	2015	Austria	DAIAM International Scientific Book 2015	case study	Non-Empiric
Green Information Systems Integration in Information Technology Based Organizations: An Academic Literature Review	2016	Norway	JOURNAL OF SOFT COMPUTING AND DECISION SUPPORT SYSTEMS	systematic literature review	Non-Empiric
Toward a Design Theory for Green Information Systems	2016	Australia	2016 49th Hawaii International Conference on System Sciences (HICSS)	systematic literature review	Non-Empiric
Employees' collaborative use of green information systems for corporate sustainability: motivation, effort and performance	2017	China	Information Technology for Development	Design Science Research	Non-Empiric
Employees' Collaborative Use of Green Information Systems	2017	China	Information Technology for Development	Survey	Empiric
Information systems and sustainable supply chain management towards a more sustainable society: where we are and where we are going	2017	Brazil	International Journal of Information Management	systematic literature review	Non-Empiric
The Sustainability Imperative in Information Systems Research	2017	United States	AIS journal	Panel discussion	Non-Empiric
Peas and carrots: just because they are green? Operational fit between green supply chain management and green information system	2018	China	Information Sysk. Tsk. Technology In (ITF)	Survey	Empiric
Green Logistics Implementation Factors: A Study on a Global Logistics Provider	2016	Australia	Journal of Advanced Manufacturing Technology (JAMT)	Case Study	Empiric
Role of Green Information System and Information Cycle in Environmental Performance	2016	Pakistan	International Conference on Management Science and Engineering Management	Survey	Empiric
Autonomous Unmanned Ground Vehicles for Urban Logistics: Optimization of Last Mile Delivery Operations	2016		Intelligent Decision Support and Big Data for Logistics and Supply Chain Management		

9.22 Forms of theoretical contributions in the Information Systems context

	<i>Type of contribution</i>	<i>Description</i>	<i>Examples</i>
1	Concept (Eisenhardt 1998; Walsham 1995)	The conceptual vocabulary of a domain (such as ERP)	'Informaté' from Zuboff (Walsham 1995)
2	Construct (Yin 2014)	An operational measure	'User Experience' can be high/low.
3	Rich insight (Walsham 1995)	Insights beyond concepts, theories or specific implications	Limits of machine intelligence; differences between plans and practical actions; need for more thoughtful machine design (Suchman 1987, in Walsham 1995)
4	Case study (Yin 2014) or action/field study (Mathiassen et al. 2012)	A rich description of a phenomenon in its natural context	How a company went bankrupt due to a failed ERP-system implementation (Sumner 2007)
5	Framework, Taxonomy	Framework: conceptual guide to serve as support, typically for analysis or discussion. Taxonomy: a classification system	Gregor's (2006) taxonomy of IS theories
6	Problem Solving, Research Method (Mathiassen et al. 2012)	A set of steps (algorithm or guidelines) used to perform a task	Levin's (1958) three steps for organisational change (Unfreeze-Change-Refreeze) (in Levasseur 2001)
7	Proposition (Yin 2014)	A purpose with criteria. An initial, 'high-level' version of a hypothesis	"There exists a set of Critical Success Factors for IS projects"
8	Generative Mechanisms (Bhaskar 1979)	Causal, self-reinforcing processes behind an output	A bank goes bankrupt (the output) due to self-fulfilling prophecy (the mechanism) (Adapted from Henfridsson and Bygstad 2013)
9	Hypothesis	An explanation for a phenomenon. Must be testable and subject to further research before it becomes theory (unless falsified)	Hypothesis: "All swans are white". Black swans were observed and falsified the hypothesis (Popper 1938)
10	Model	A set of propositions or statements expressing relationships among concepts or constructs	Often a visualisation with boxes and arrows (see our examples below in Table 3)
11	Mid-range theory (Merton 1968, in Grover and Lyytinen 2015)	Typically borrows theory from reference disciplines such as sociology	Giddens' <i>Structuration Theory</i> as (one of many) fundament(s) for <i>Information Infrastructure Theory</i> (Hanseth and Lyytinen 2010)
12	Design theory	Focus on building a technological artefact	A three-cycle view of Design Science Research (Hevner 2007)
13	Grand theory (Gregor 2006)	Generalizations that are relatively unbounded in space and time	<i>Systems Theory</i> (Ashby 1956; von Bertalanffy 1973, in Gregor 2006)

Table 18: Forms of theoretical contributions in the Information Systems context (Presthus and Munkvold, 2016)

9.23 Submission and declaration form for Bachelor's and Master's theses



Innleverings- og erklæringskjema for Bachelor- og Masteroppgaver

- Bachelor- eller Masteroppgaven skal leveres separat i [WISEflow](#)
- Formelle skjemaer: Erklæringskjema leveres samtidig med bachelor-/masteroppgaven
- Loggskjema er valgfritt

Den enkelte student er selv ansvarlig for å sette seg inn i hva som er lovlige hjelpemidler, retningslinjer for bruken av disse og regler om kildebruk. Ved gruppearbeid er alle i gruppen gjensidig ansvarlig for innholdet i oppgaven. Manglende erklæring fritar ikke studentene fra sitt ansvar.

Innlevering (fyller ut av en student på gruppen):

Tittel på masteroppgaven, både norsk og engelsk som registrert i StudentWeb				
Assessing the Impacts of Green Information Systems in a Norwegian Post/Logistics company: A Qualitative Case Study				
Kartlegge Effekten av Grønne Informasjon Systemer i et Norsk post-/Logistikkelskap: En Kvalitativ Case Studie				
Etternavn, fornavn mellomnavn (hvis gruppe; en kontaktperson på vegne av gruppen):				
Abdullah Hassan Al Eboudi				
Kandidatnummer:	Kandidatnummer:	Kandidatnummer:	Kandidatnummer:	Kandidatnummer:
1058	1062			
Adresse:	Postnummer:	Sted:		
Lindebergåsen 28 G	1068	Oslo		
Telefon:	E-post:			
91 91 22 71	Aleboudi08@gmail.com			
Eksamenssted:	Navn på veileder:			
Oslo	Wanda Presthus			
Eksamensdato:	Emnet teller studiepoeng:			
22.05.23	Master in Information Systems -Digital Business Systems			
Dato:				
21.05.23				

Erklæring

Jeg/vi erklærer herved at oppgaven som er levert:

1. Er eget arbeid og ikke har mottatt annen hjelp enn det som er nevnt i besvarelsen
2. Ikke har vært levert i noen annen sammenheng tidligere
3. Ikke refererer til eget tidligere arbeid uten at dette er oppgitt

4. Har oppgitt alle referanser i litteraturlisten
5. At alle deltakerne ved gruppeoppgaven har bidratt likeverdig
6. Er behandlet i henhold til personopplysningsloven

Jeg/vi er kjent med at brudd på disse bestemmelsene er å betrakte som fusk.

Alle bachelor - og masteroppgaver med karakteren A kan tilgjengeliggjøres i biblioteket ved Høgskolen Kristiania etter sensur, med forfatterens navn jfr. "Vilkår for tilgjengeliggjøring av bachelor- og masteroppgaver ved høyskolen" nederst i dette dokumentet. Ved avhuking av boksene samt signatur av erklærings skjemaet godkjenner man også vilkårene for tilgjengeliggjøring.

Oppgaven skal normalt ikke være konfidensiell, men for bachelor-/masteroppgaver som inneholder spesiell sensitiv informasjon eller ønskes behandlet konfidensielt av oppgavesponsor, må dette markeres på forsiden med rødt trykk **KONFIDENSIELL**. Dette gjelder også om dokumentet eller deler av dokumentet inneholder fotografier, tegninger, illustrasjoner, film eller annet opphavsrettslig beskyttet materiale, garanterer forfatteren at han har innhentet de nødvendige tillatelser fra tredjemann på forhånd.

Bachelor-/Masteroppgaver som er begjært konfidensiell, vil ikke bli tilgjengeliggjort i fysisk eller elektronisk bibliotek.

- Bachelor-/Masteroppgaven er ikke begjært konfidensiell.
- Jeg/vi godkjenner vilkårene og samtykker herved at bachelor-/Masteroppgaven kan tilgjengeliggjøres.
- Jeg/vi har registrert tittel på Studentweb.

Sted og dato: OSLO, 21.05.2023 _____

Kandidatnummer: 1058	Signatur: <i>Abdullah Al Boudi</i>
Kandidatnummer: 1062	Signatur: <i>Juliana A. Grøttjord</i>
Kandidatnummer:	Signatur:
Kandidatnummer:	Signatur:
Kandidatnummer:	Signatur:

